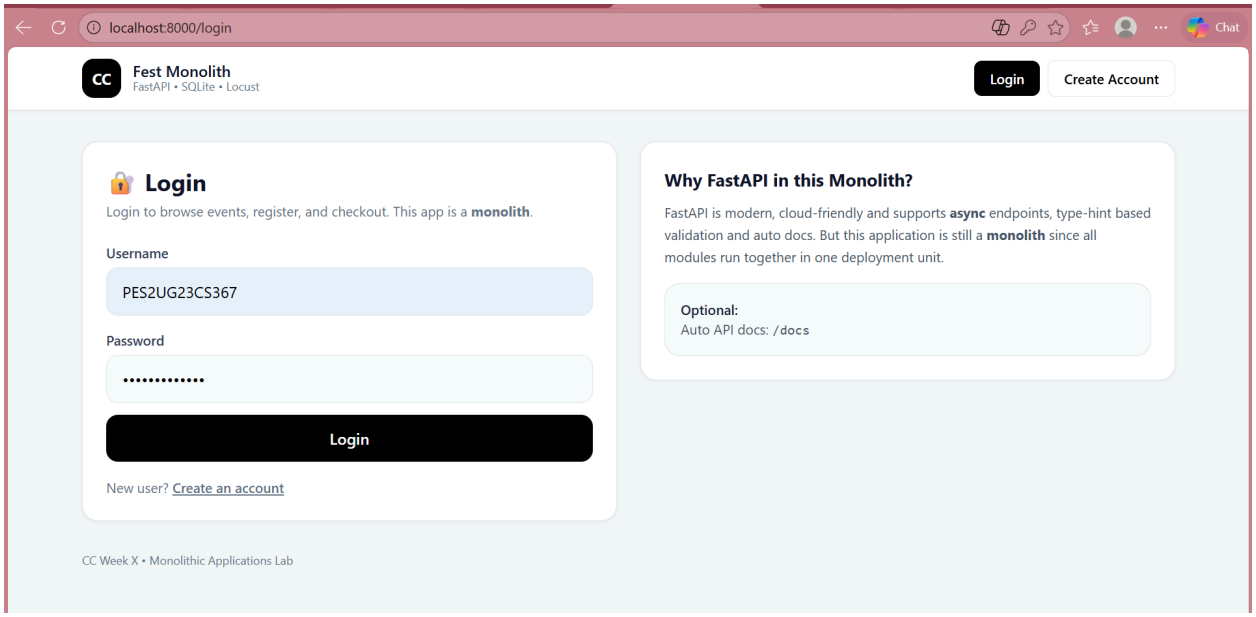
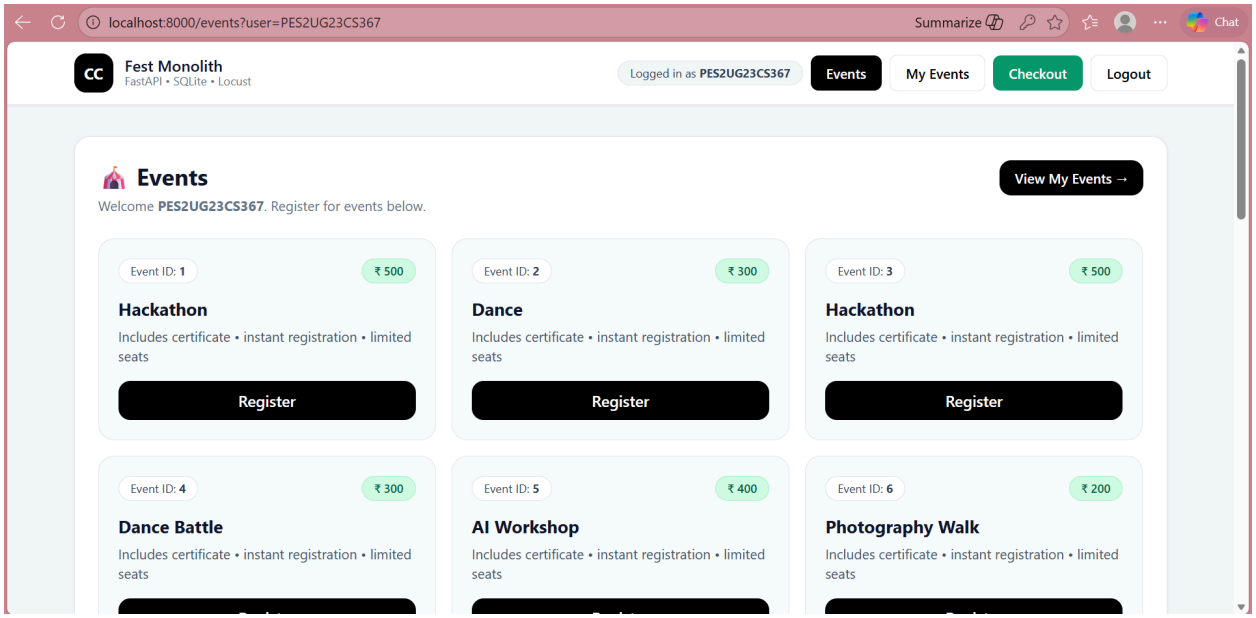
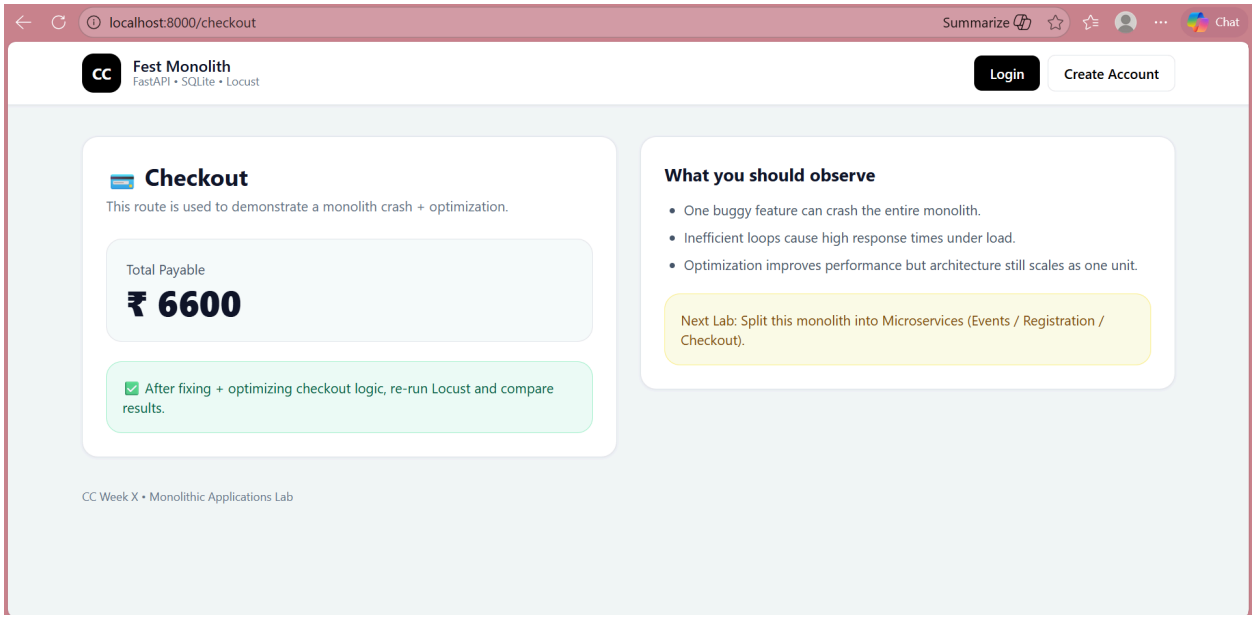
CC LAB-2

NAME:N.VAISHNAVI
SECTION:6F
SRN:PES2UG23CS367
DATE:20-01-20226

GITHUB REPO LINK:
PES2UG23CS367/CC_LAB-2




localhost:8000/events?user=PES2UG23CS367
Summarize
Chat
CC
Fest Monolith
FastAPI • SQLite • Locust
Logged in as PES2UG23CS367
Events
My Events
Checkout
Logout
Events
View My Events →
Welcome PES2UG23CS367. Register for events below.
Event ID: 1
₹ 500
Hackathon
Includes certificate • instant registration • limited seats
Register
Event ID: 2
₹ 300
Dance
Includes certificate • instant registration • limited seats
Register
Event ID: 3
₹ 500
Hackathon
Includes certificate • instant registration • limited seats
Register
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


localhost:8000/checkout
Summarize
Chat
CC
Fest Monolith
FastAPI • SQLite • Locust
Login
Create Account
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

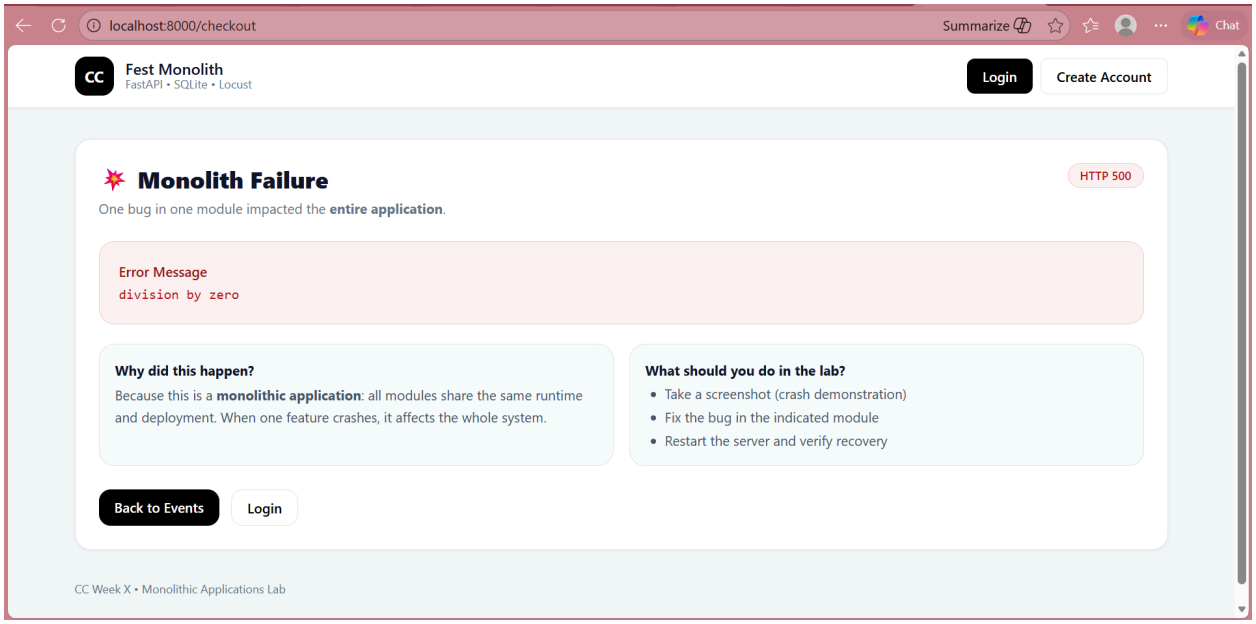
```
PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367> python -m venv
 .venv
>>
PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367> .\.venv\Script
s\activate
>>
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367> pip in
stall -r requirements.txt
>>
Collecting fastapi
```

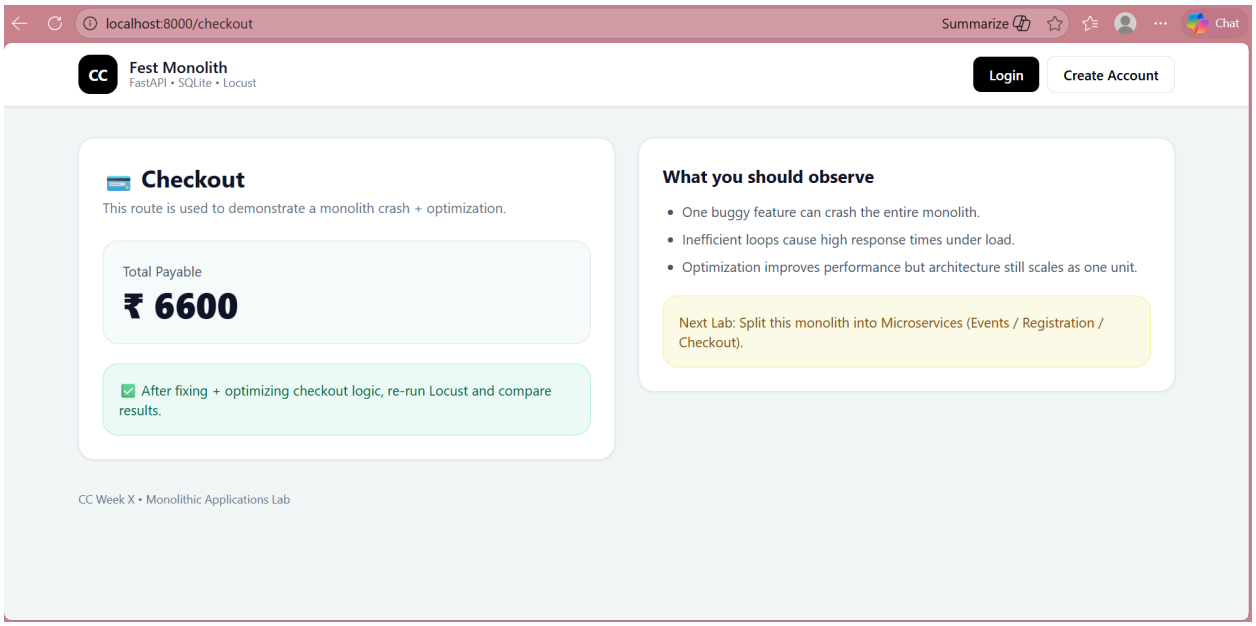
Explore and understand your code Auto

```
Collecting uvicorn
  Downloading uvicorn-0.40.0-py3-none-any.whl (68 kB)
     |████████████████████████████████| 68 kB 3.3 MB/s
Collecting jinja2
  Downloading jinja2-3.1.6-py3-none-any.whl (134 kB)
     |████████████████████████████████| 134 kB 6.4 MB/s
Collecting python-multipart
  Downloading python_multipart-0.0.21-py3-none-any.whl (24 kB)
Collecting locust
  Downloading locust-2.43.1-py3-none-any.whl (1.5 MB)
     |████████████████████████████████| 1.5 MB 6.4 MB/s
Collecting starlette<0.51.0,>=0.40.0
  Downloading starlette-0.50.0-py3-none-any.whl (74 kB)
     |████████████████████████████████| 74 kB 5.5 MB/s
Collecting pydantic>=2.7.0
```

Explore and understand your code Auto

```
 Lab-2\PES2UG23CS367\.venv\Scripts\python.exe -m pip install --upgrade pip' comma
nd.
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367> python
 insert_events.py
>>
✅ Events inserted successfully!
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367> python
 -m uvicorn main:app --reload
>>
INFO:     Will watch for changes in these directories: ['C:\\Users\\HP\\Downloads
\\Monolith_CC_Lab-2\\CC Lab-2\\PES2UG23CS367']
INFO:     Uvicorn running on http://127.0.0.1:8000 (Press CTRL+C to quit)
INFO:     Started reloader process [19808] using StatReload
INFO:     Started server process [7788]
INFO:     Waiting for application startup.
```


localhost:8000/checkout
Summarize
Chat
CC
Fest Monolith
FastAPI • SQLite • Locust
Login
Create Account
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
Back to Events
Login
CC Week X • Monolithic Applications Lab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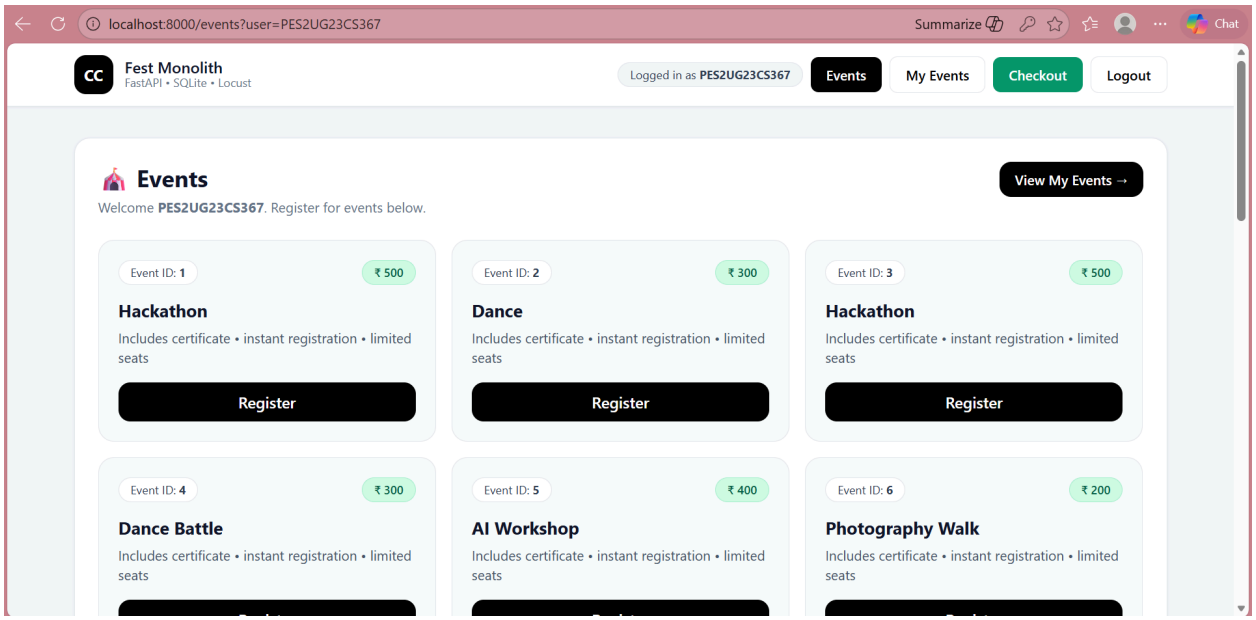
CC Week X • Monolithic Applications Lab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Event ID: 3
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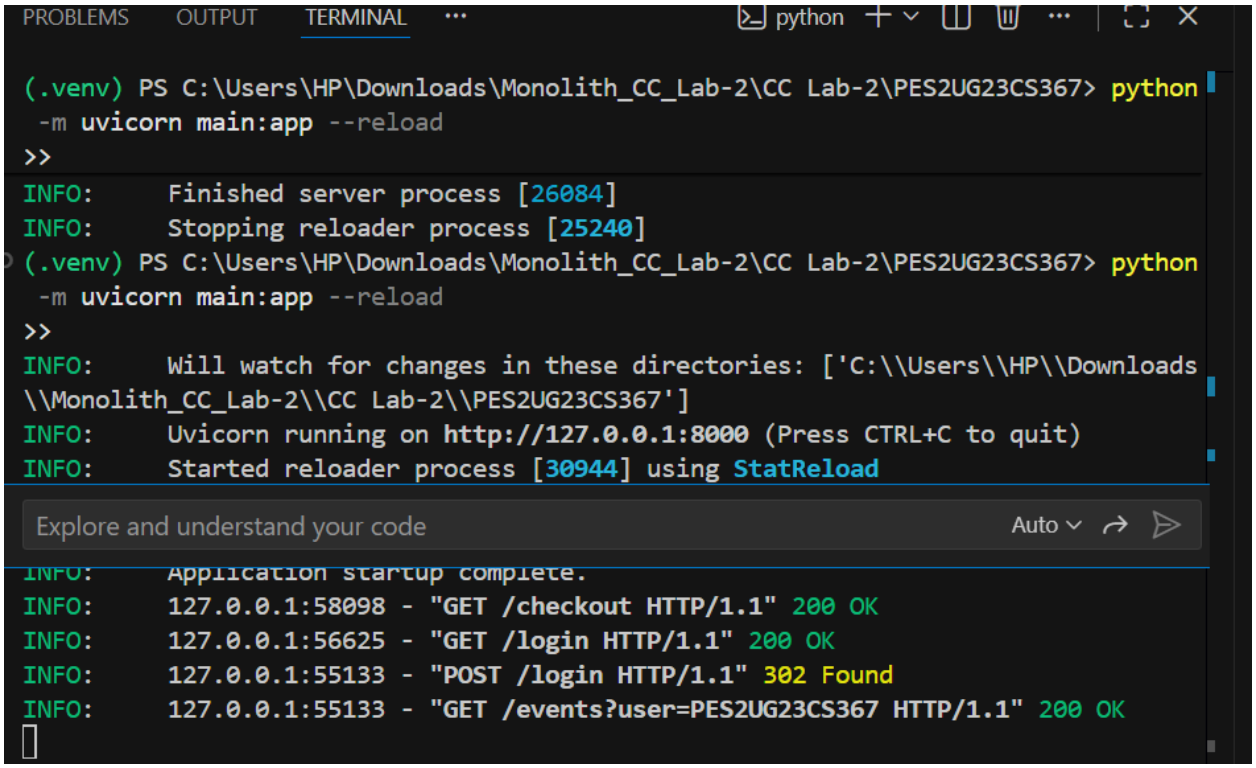
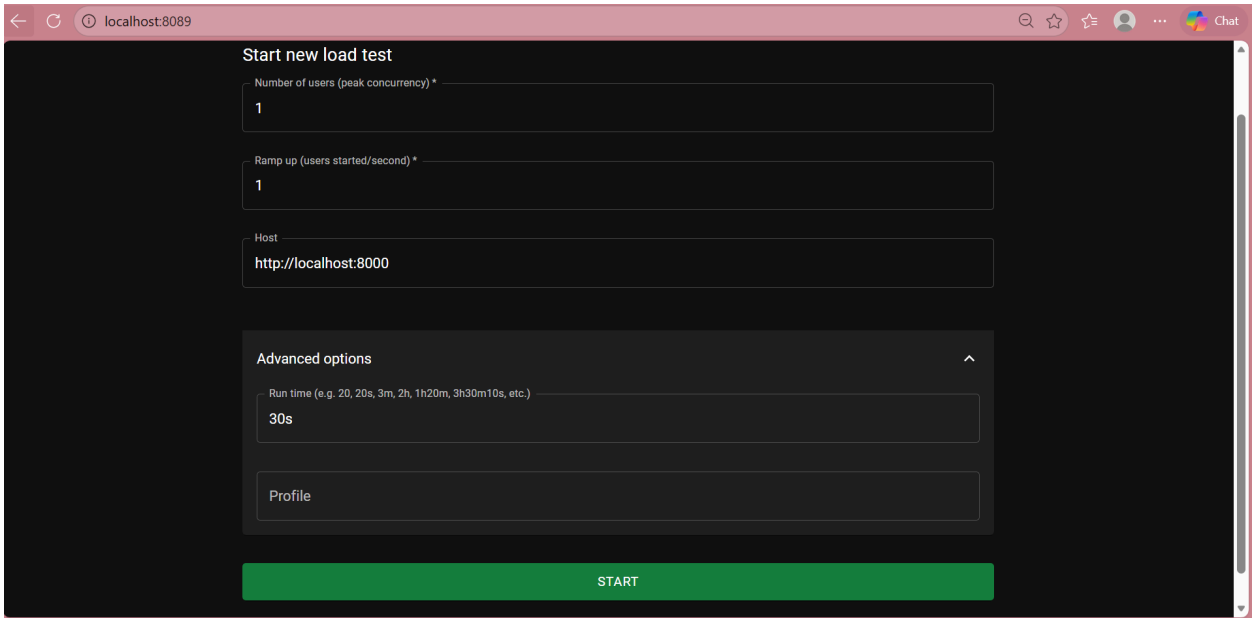
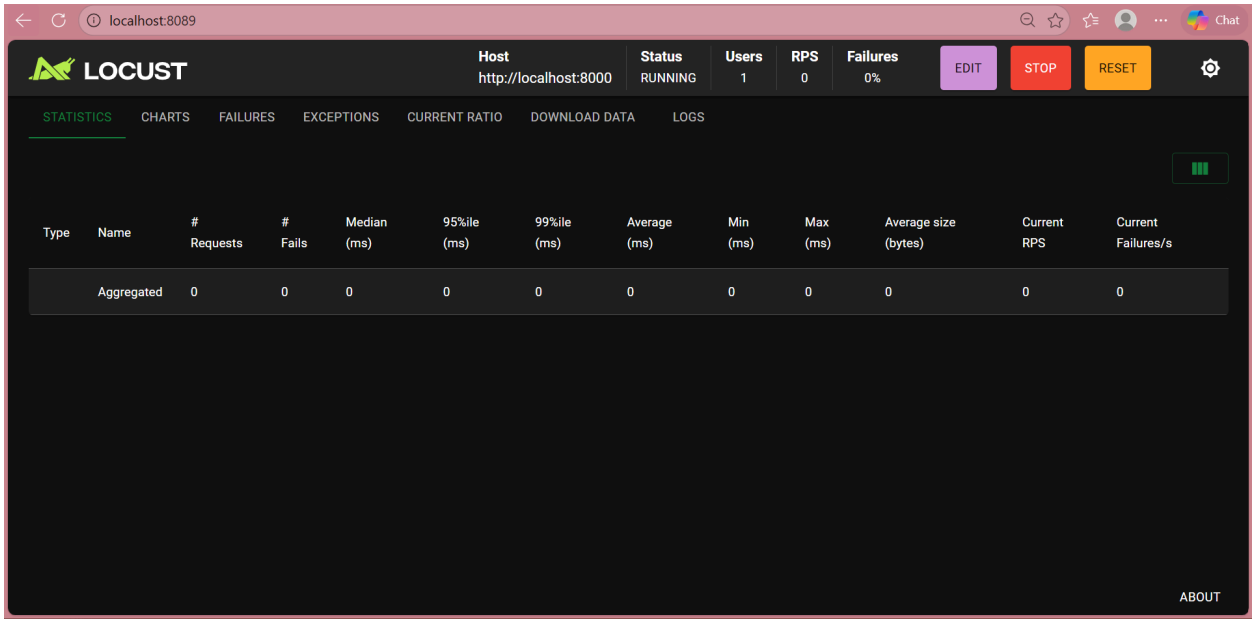
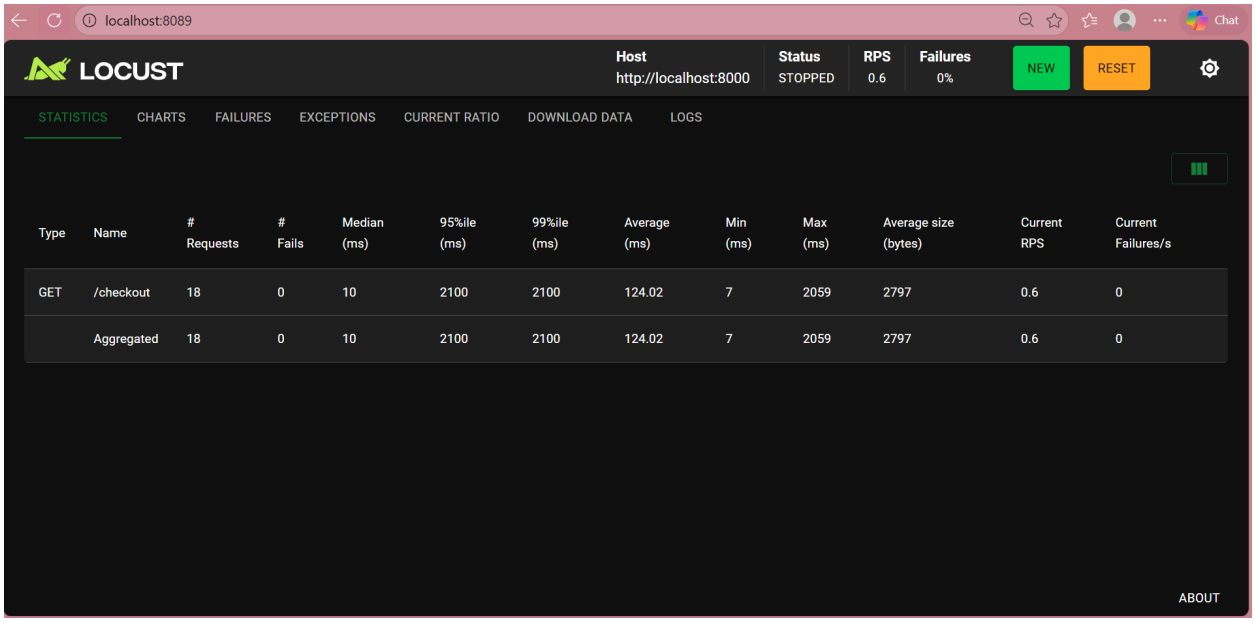
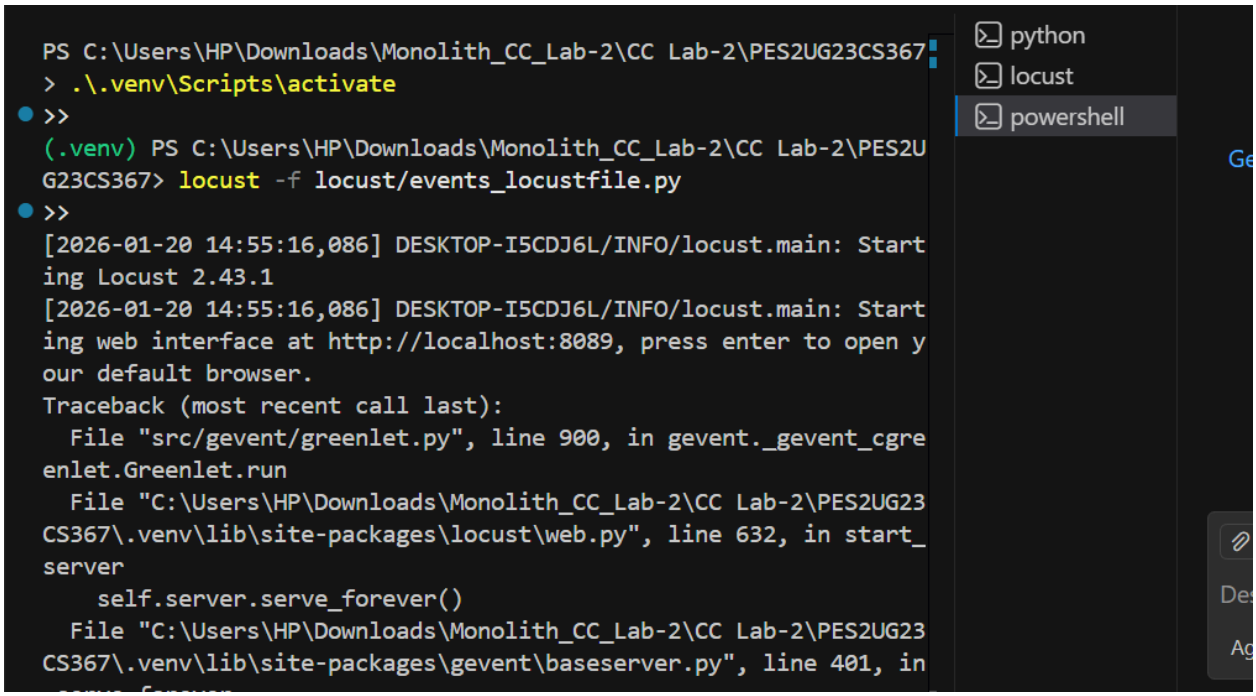
Register
Event ID: 4
₹ 300
Dance Battle
Includes certificate • instant registration • limited seats
Event ID: 5
₹ 400
AI Workshop
Includes certificate • instant registration • limited seats
Event ID: 6
₹ 200
Photography Walk
Includes certificate • instant registration • limited seats

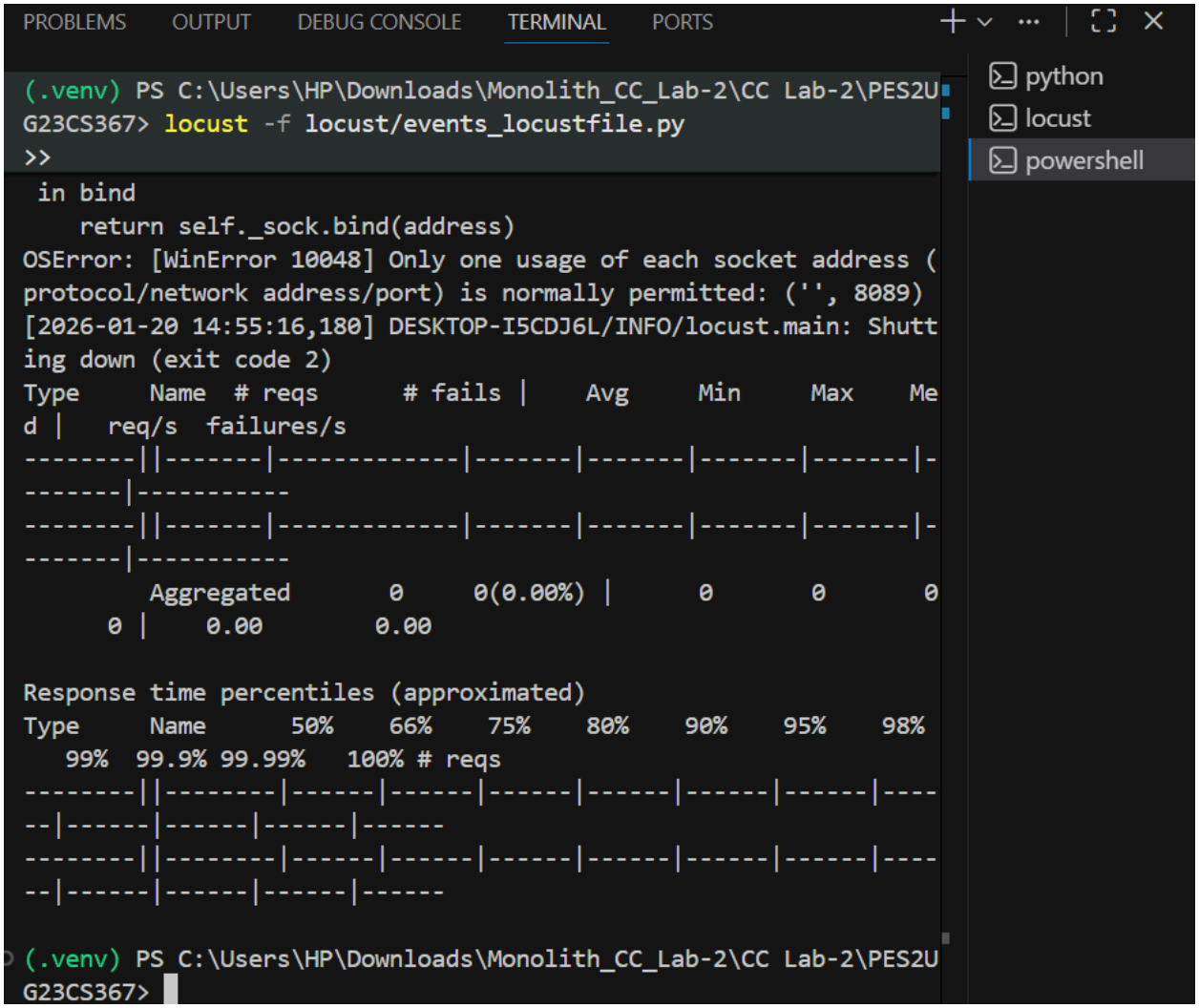

PROBLEMS
OUTPUT
TERMINAL
python
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367> python -m uvicorn main:app --reload
>>
INFO: Finished server process [26084]
INFO: Stopping reloader process [25240]
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367> python -m uvicorn main:app --reload
>>
INFO: Will watch for changes in these directories: ['C:\\Users\\HP\\Downloads\\Monolith_CC_Lab-2\\CC Lab-2\\PES2UG23CS367']
INFO: Uvicorn running on http://127.0.0.1:8000 (Press CTRL+C to quit)
INFO: Started reloader process [30944] using StatReload
Explore and understand your code
Auto
INFO: Application startup complete.
INFO: 127.0.0.1:58098 - "GET /checkout HTTP/1.1" 200 OK
INFO: 127.0.0.1:56625 - "GET /login HTTP/1.1" 200 OK
INFO: 127.0.0.1:55133 - "POST /login HTTP/1.1" 302 Found
INFO: 127.0.0.1:55133 - "GET /events?user=PES2UG23CS367 HTTP/1.1" 200 OK


localhost:8089
Chat
Start new load test
Number of users (peak concurrency) *
1
Ramp up (users started/second) *
1
Host
http://localhost:8000
Advanced options
Run time (e.g. 20, 20s, 3m, 2h, 1h20m, 3h30m10s, etc.)
30s
Profile
START


localhost:8089
Chat
LOCUST
Host
http://localhost:8000
Status
RUNNING
Users
1
RPS
0
Failures
0%
EDIT
STOP
RESET
STATISTICS
CHARTS
FAILURES
EXCEPTIONS
CURRENT RATIO
DOWNLOAD DATA
LOGS
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
Aggregated
0
0
0
0
0
0
0
0
0
0
0
ABOUT

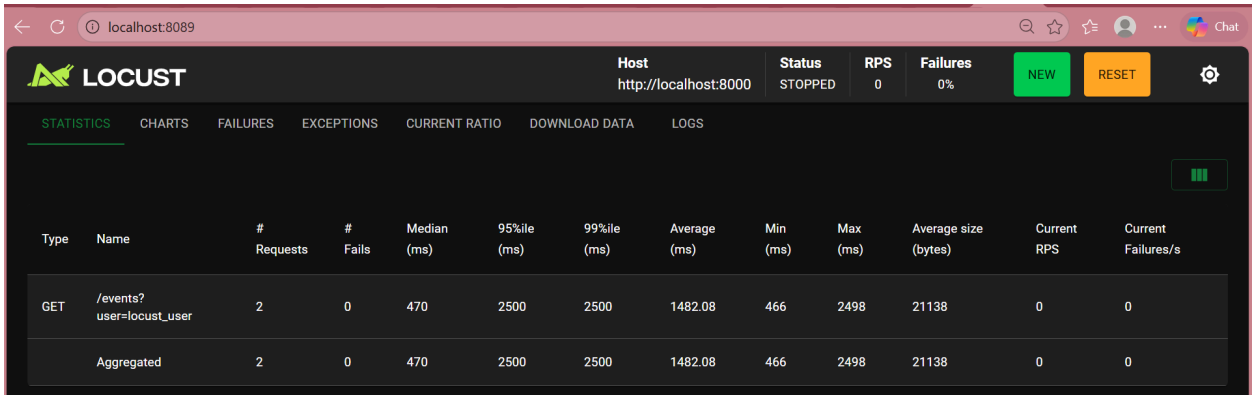

localhost:8089
Chat
LOCUST
Host
http://localhost:8000
Status
STOPPED
RPS
0.6
Failures
0%
NEW
RESET
STATISTICS
CHARTS
FAILURES
EXCEPTIONS
CURRENT RATIO
DOWNLOAD DATA
LOGS
Type
Name
Requests
Fails
Median (ms)
95%ile (ms)
99%ile (ms)
Average (ms)
Min (ms)
Max (ms)
Average size (bytes)
Current RPS
Current Failures/s
GET
/checkout
18
0
10
2100
2100
124.02
7
2059
2797
0.6
0
Aggregated
18
0
10
2100
2100
124.02
7
2059
2797
0.6
0
ABOUT


PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367
> .\.venv\Scripts\activate
>>
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2U
G23CS367> locust -f locust/events_locustfile.py
>>
[2026-01-20 14:55:16,086] DESKTOP-I5CDJ6L/INFO/locust.main: Start
ing Locust 2.43.1
[2026-01-20 14:55:16,086] DESKTOP-I5CDJ6L/INFO/locust.main: Start
ing web interface at http://localhost:8089, press enter to open y
our default browser.
Traceback (most recent call last):
File "src/gevent/greenlet.py", line 900, in gevent._gevent_cgre
enlet.Greenlet.run
File "C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23
CS367\.venv\lib\site-packages\locust\web.py", line 632, in start_
server
self.server.serve_forever()
File "C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23
CS367\.venv\lib\site-packages\gevent\baseserver.py", line 401, in
python
locust
powershell


PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
python
locust
powershell
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367> locust -f locust/events_locustfile.py
>>
in bind
return self._sock.bind(address)
OSError: [WinError 10048] Only one usage of each socket address (protocol/network address/port) is normally permitted: ('', 8089)
[2026-01-20 14:55:16,180] DESKTOP-I5CDJ6L/INFO/locust.main: Shutting down (exit code 2)
Type Name # reqs # fails | Avg Min Max Med | req/s failures/s
Aggregated 0 0(0.00%) | 0 0 0 0 | 0.00 0.00
Response time percentiles (approximated)
Type Name 50% 66% 75% 80% 90% 95% 98% 99% 99.9% 99.99% 100% # reqs
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367>

```
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2U
G23CS367> locust -f locust/checkout_locustfile.py
>>
2026-01-20T09:30:28Z
[2026-01-20 15:00:28,159] DESKTOP-I5CDJ6L/INFO/locust.main: Shutt
ing down (exit code 0)
Type     Name  # reqs      # fails |    Avg     Min     Max    Me
d |   req/s  failures/s
--------||-------|-------------|-------|-------|-------|-------|-
-------|-----------
GET      /checkout      18     0(0.00%) |    124       7    2058
    10 |    0.64        0.00
--------||-------|-------------|-------|-------|-------|-------|-
-------|-----------
         Aggregated      18     0(0.00%) |    124       7    2058
     10 |    0.64        0.00

Response time percentiles (approximated)
Type     Name       50%    66%    75%    80%    90%    95%    98%
   99%  99.9% 99.99%   100% # reqs
--------||--------|------|------|------|------|------|------|----
--|------|------|------|------
GET      /checkout        10     10     11     13     14   2100
2100   2100   2100   2100   2100     18
--------||--------|------|------|------|------|------|------|----
--|------|------|------|------
         Aggregated       10     10     11     13     14   2100
```



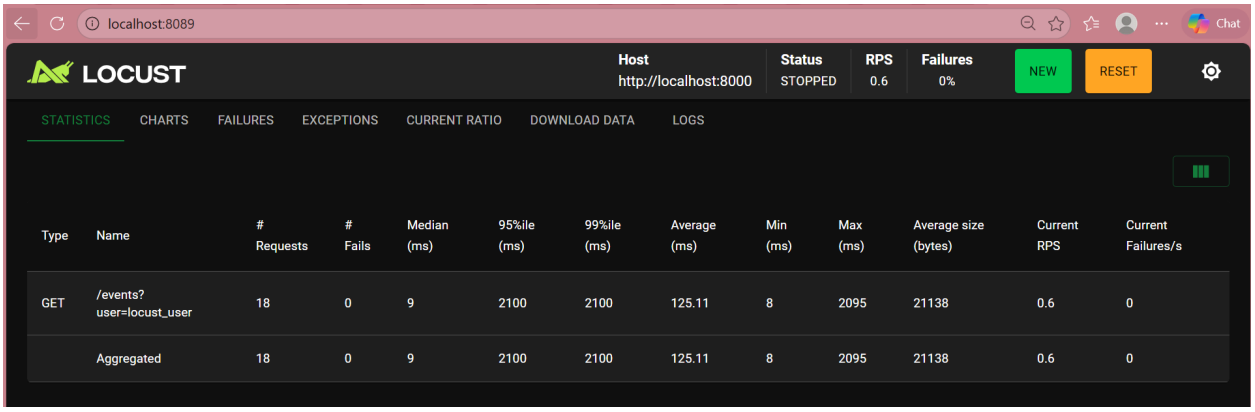
```
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2U
    Aggregated       10     10     11     13     14   2100   2100   21
00   2100   2100   2100     18

(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2U

(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS
367> locust -f locust/events_locustfile.py
>>
[2026-01-20 15:01:24,065] DESKTOP-I5CDJ6L/INFO/locust.main: Starting L
ocust 2.43.1
[2026-01-20 15:01:24,065] DESKTOP-I5CDJ6L/INFO/locust.main: Starting w
eb interface at http://localhost:8089, press enter to open your defaul
t browser.
[2026-01-20 15:01:46,990] DESKTOP-I5CDJ6L/INFO/locust.runners: Ramping
 to 1 users at a rate of 1.00 per second
[2026-01-20 15:01:46,990] DESKTOP-I5CDJ6L/INFO/locust.runners: All use
rs spawned: {"EventsUser": 1} (1 total users)
```

```
Type     Name       50%    66%    75%    80%    90%    95%    98%    99
%  99.9% 99.99%   100% # reqs
--------||--------|------|------|------|------|------|------|----Respo
[2026-01-20 15:21:07,698] DESKTOP-I5CDJ6L/INFO/locust.main: Shutting d
own (exit code 0)
Type     Name  # reqs      # fails |    Avg     Min     Max    Med |
 req/s  failures/s
--------||-------|-------------|-------|-------|-------|-------|------
--|-----------
GET      /events?user=locust_user       2     0(0.00%) |   1482     46
5    2498    470 |    0.47        0.00
--------||-------|-------------|-------|-------|-------|-------|------
--|-----------
         Aggregated       2     0(0.00%) |   1482     465    2498    4
70 |    0.47        0.00

Response time percentiles (approximated)
Type     Name       50%    66%    75%    80%    90%    95%    98%    99
%  99.9% 99.99%   100% # reqs
--------||--------|------|------|------|------|------|------|------|--
----|------|------|------
GET      /events?user=locust_user     2500   2500   2500   2500   2500
   2500   2500   2500   2500   2500   2500      2
--------||--------|------|------|------|------|------|------|------|--
----|------|------|------
         Aggregated     2500   2500   2500   2500   2500   2500   2500
   2500   2500   2500   2500      2
```



```
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367> python -m uvicorn main:app --reload
INFO:     Will watch for changes in these directories: ['C:\\Users\\HP
\\Downloads\\Monolith_CC_Lab-2\\CC Lab-2\\PES2UG23CS367']
INFO:     Uvicorn running on http://127.0.0.1:8000 (Press CTRL+C to qu
it)
INFO:     Started reloader process [10008] using StatReload
INFO:     Started server process [21524]
INFO:     Waiting for application startup.
INFO:     Application startup complete.
INFO:     Shutting down
INFO:     Waiting for application shutdown.
INFO:     Application shutdown complete.
INFO:     Finished server process [21524]
INFO:     Stopping reloader process [10008]
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS
367> locust -f locust/events_locustfile.py
>>
[2026-01-20 15:21:35,974] DESKTOP-I5CDJ6L/INFO/locust.main: Starting L
ocust 2.43.1
[2026-01-20 15:21:35,974] DESKTOP-I5CDJ6L/INFO/locust.main: Starting w
eb interface at http://localhost:8089, press enter to open your defaul
```
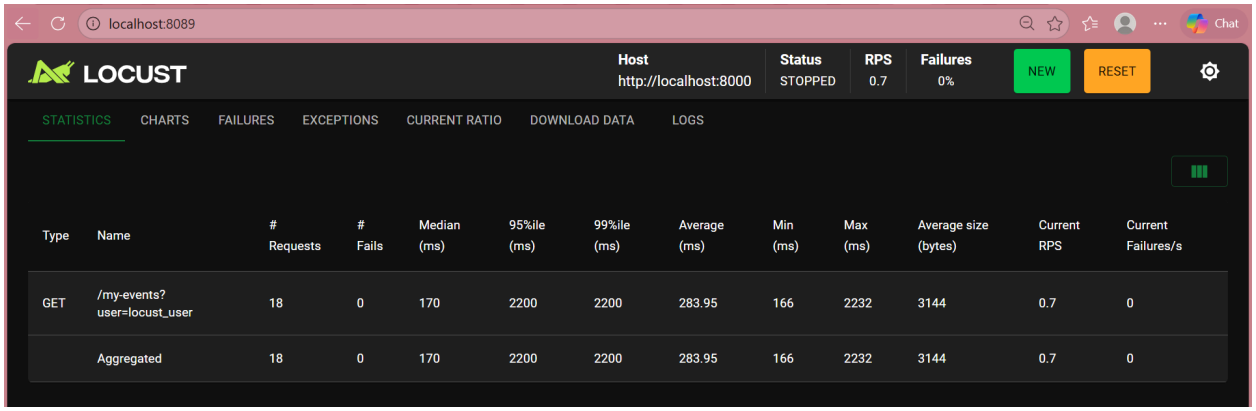
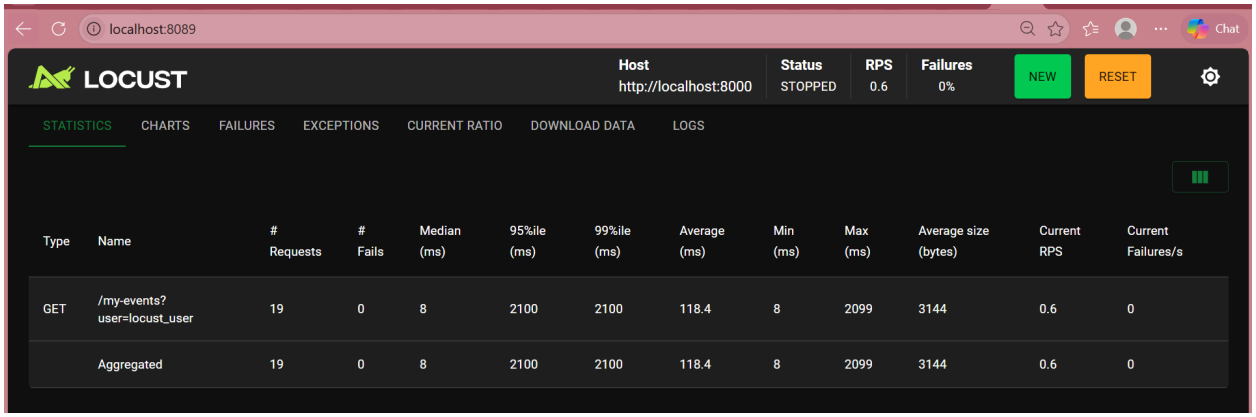
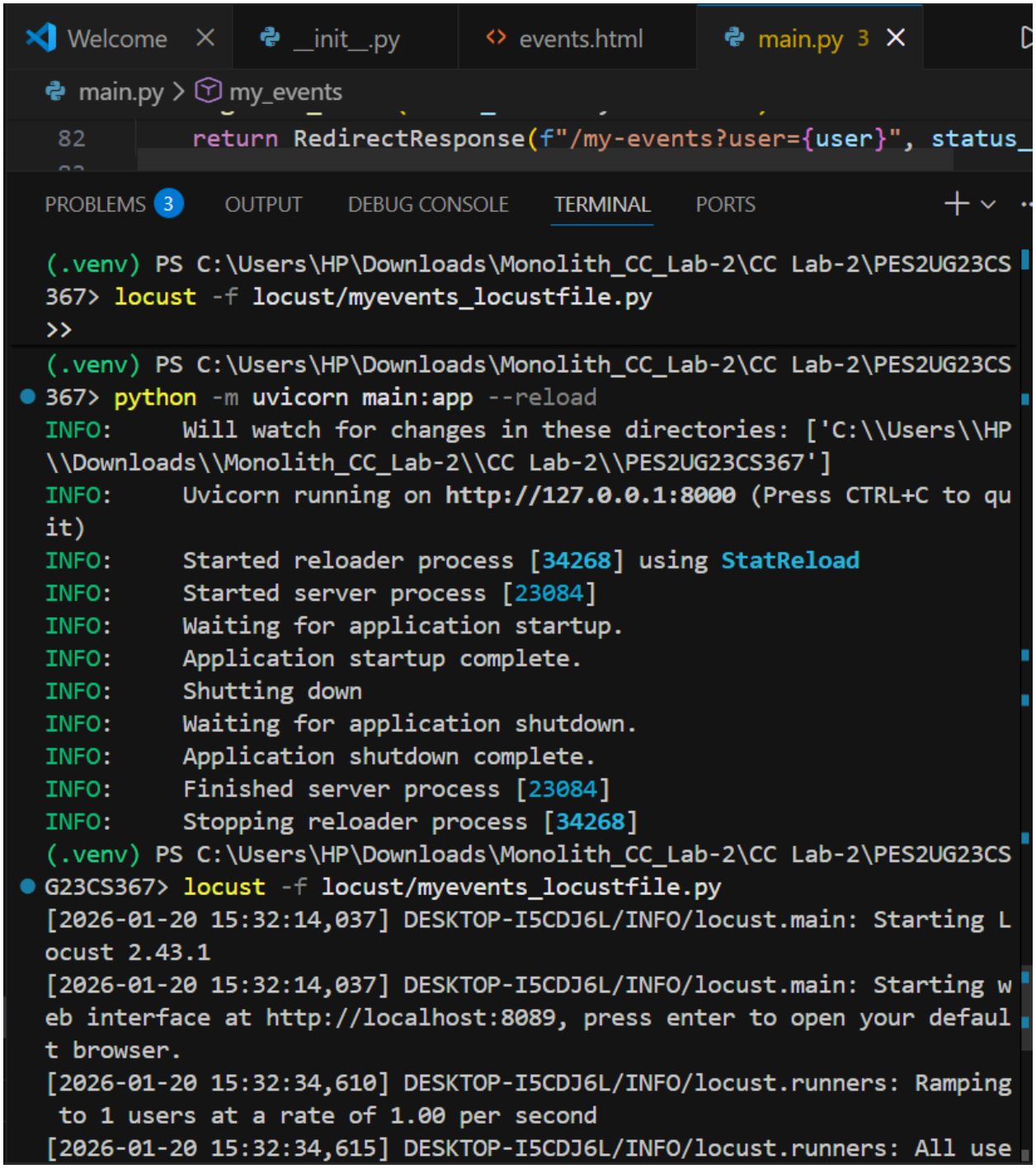

```
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS
367> locust -f locust/events_locustfile.py
>>
[2026-01-20 15:26:24,282] DESKTOP-I5CDJ6L/INFO/locust.main: Shutting d
own (exit code 0)
Type     Name  # reqs      # fails |    Avg     Min     Max    Med |
 req/s  failures/s
--------||-------|-------------|-------|-------|-------|-------|------
--|-----------
GET      /events?user=locust_user      18     0(0.00%) |    125
8    2095      9 |    0.62        0.00
--------||-------|-------------|-------|-------|-------|-------|------
--|-----------
         Aggregated      18     0(0.00%) |    125       8    2095
 9 |    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      /events?user=locust_user        9      9     10     10     12
   2100   2100   2100   2100   2100   2100     18
--------||--------|------|------|------|------|------|------|------|--
----|------|------|------
         Aggregated        9      9     10     10     12   2100   2100
   2100   2100   2100   2100     18
```

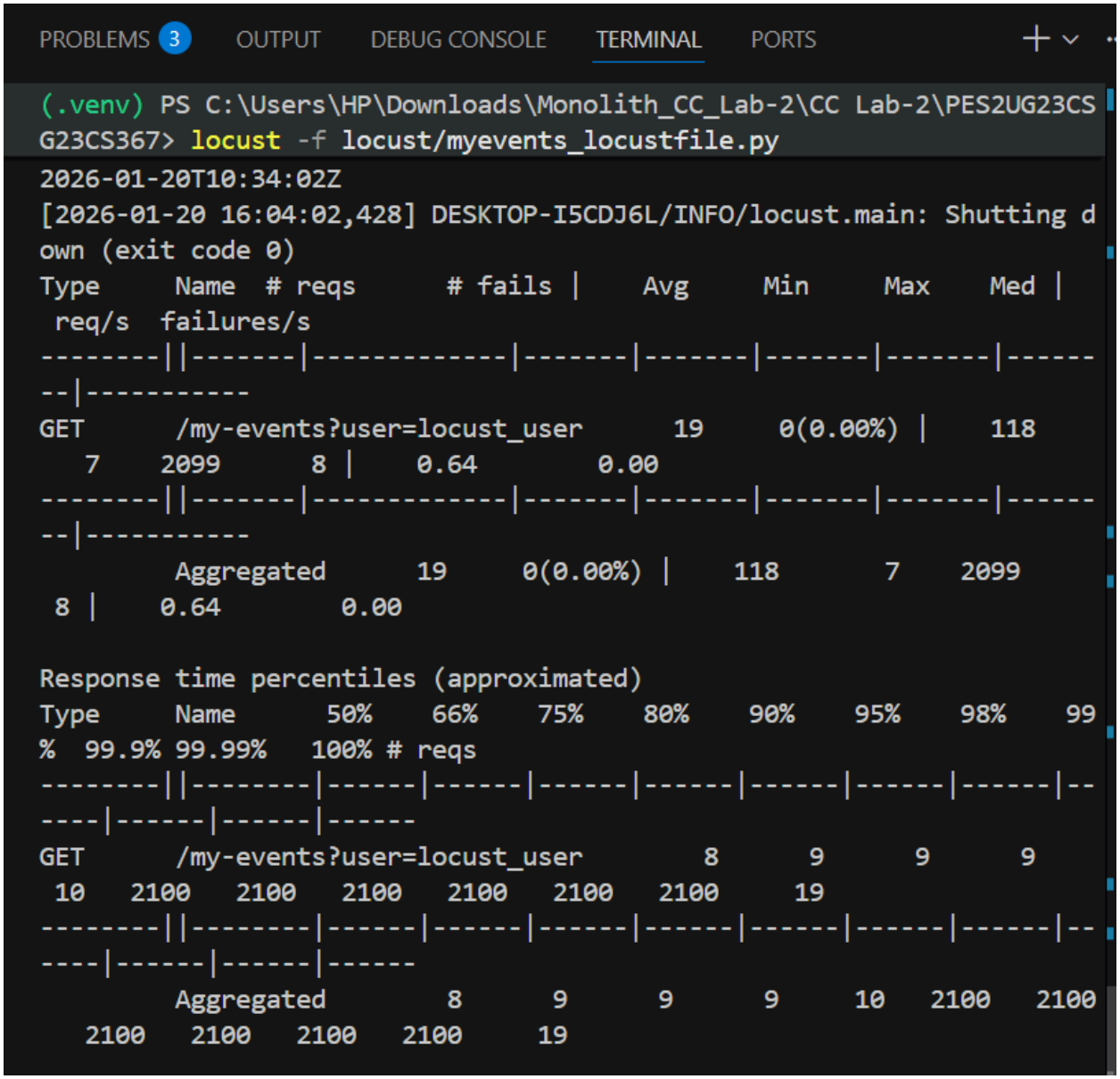


```
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS
367> locust -f locust/myevents_locustfile.py
>>
[2026-01-20 15:26:36,604] DESKTOP-I5CDJ6L/INFO/locust.main: Starting L
ocust 2.43.1
[2026-01-20 15:26:36,604] DESKTOP-I5CDJ6L/INFO/locust.main: Starting w
eb interface at http://localhost:8089, press enter to open your defaul
t browser.
[2026-01-20 15:26:55,941] DESKTOP-I5CDJ6L/INFO/locust.runners: Ramping
 to 1 users at a rate of 1.00 per second
[2026-01-20 15:26:55,942] DESKTOP-I5CDJ6L/INFO/locust.runners: All use
rs spawned: {"MyEventsUser": 1} (1 total users)
Traceback (most recent call last):
  File "C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367
\.venv\lib\site-packages\gevent\_ffi\loop.py", line 279, in python_che
ck_callback
    def python_check_callback(self, watcher_ptr): # pylint:disable=unu
sed-argument
KeyboardInterrupt
2026-01-20T10:01:54Z
[2026-01-20 15:31:54,077] DESKTOP-I5CDJ6L/INFO/locust.main: Shutting d
own (exit code 0)
```

```
367> locust -f locust/myevents_locustfile.py
>>
[2026-01-20 15:31:54,077] DESKTOP-I5CDJ6L/INFO/locust.main: Shutting d
own (exit code 0)
Type     Name  # reqs      # fails |    Avg     Min     Max    Med |
 req/s  failures/s
--------||-------|-------------|-------|-------|-------|-------|------
--|-----------
GET      /my-events?user=locust_user      18     0(0.00%) |    283
 165    2231    170 |    0.61        0.00
--------||-------|-------------|-------|-------|-------|-------|------
--|-----------
         Aggregated      18     0(0.00%) |    283     165    2231    1
70 |    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      /my-events?user=locust_user      170    170    170    170
180   2200   2200   2200   2200   2200   2200     18
--------||--------|------|------|------|------|------|------|------|--
----|------|------|------
         Aggregated      170    170    170    170    180   2200   2200
   2200   2200   2200   2200     18
```




Welcome
__init__.py
events.html
main.py 3
main.py > my_events
82 return RedirectResponse(f"/my-events?user={user}", status_
PROBLEMS 3
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367> locust -f locust/myevents_locustfile.py
>>
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS367> python -m uvicorn main:app --reload
INFO: Will watch for changes in these directories: ['C:\\Users\\HP\\Downloads\\Monolith_CC_Lab-2\\CC Lab-2\\PES2UG23CS367']
INFO: Uvicorn running on http://127.0.0.1:8000 (Press CTRL+C to quit)
INFO: Started reloader process [34268] using StatReload
INFO: Started server process [23084]
INFO: Waiting for application startup.
INFO: Application startup complete.
INFO: Shutting down
INFO: Waiting for application shutdown.
INFO: Application shutdown complete.
INFO: Finished server process [23084]
INFO: Stopping reloader process [34268]
(.venv) PS C:\Users\HP\Downloads\Monolith_CC_Lab-2\CC Lab-2\PES2UG23CS G23CS367> locust -f locust/myevents_locustfile.py
[2026-01-20 15:32:14,037] DESKTOP-I5CDJ6L/INFO/locust.main: Starting Locust 2.43.1
[2026-01-20 15:32:14,037] DESKTOP-I5CDJ6L/INFO/locust.main: Starting web interface at http://localhost:8089, press enter to open your default browser.
[2026-01-20 15:32:34,610] DESKTOP-I5CDJ6L/INFO/locust.runners: Ramping to 1 users at a rate of 1.00 per second
[2026-01-20 15:32:34,615] DESKTOP-I5CDJ6L/INFO/locust.runners: All use



Aim

To study the limitations of a monolithic application and analyze its performance under load using Locust.

Description

A FastAPI-based monolithic application was developed with SQLite as backend. Artificial bottlenecks were introduced to demonstrate how a failure or inefficiency in one module impacts the entire system.

Observations

Checkout, events, and my-events modules initially had inefficient logic
Monolithic crash affected the whole application
Load testing showed high response times before optimization

Optimizations Performed

Removed unnecessary computational loops
Reduced redundant processing
Improved response times under load

System Architecture (Monolithic)

In a **monolithic architecture**, all application modules such as:

- Authentication
- Events
- Checkout
- My-Events

are part of **a single codebase** and run in **one process**.

Key Characteristics:

- Single deployment unit
- Shared database
- Shared runtime environment
- Tight coupling between modules

Application Description

The application allows users to:

- Register and login

- View all events
- View personal registered events
- Perform checkout operations

All functionalities are implemented inside a **single FastAPI application**, making it monolithic.

The database is accessed using SQL queries inside FastAPI routes.

What is Locust?

Locust is an **open-source load testing tool** that simulates multiple users accessing a system to measure:

- Response time
- Throughput (RPS)
- Failure rate

Checkout Module Performance

Before Optimization

- Inefficient looping logic
- High response time

(Screenshot: **SS4**)

Optimization Performed

- Replaced loop-based computation with direct summation

After Optimization

- Reduced response time

- Improved throughput

(Screenshot: **SS5**)

Optimization Performed

- Removed unnecessary computation loop
- Retained only database fetch and response rendering

After Optimization

- Significant reduction in average response time
- Improved performance under load

(Screenshot: **SS7**)

Result

Performance improved significantly after optimization, proving that inefficiencies in monolithic systems directly impact scalability and reliability.