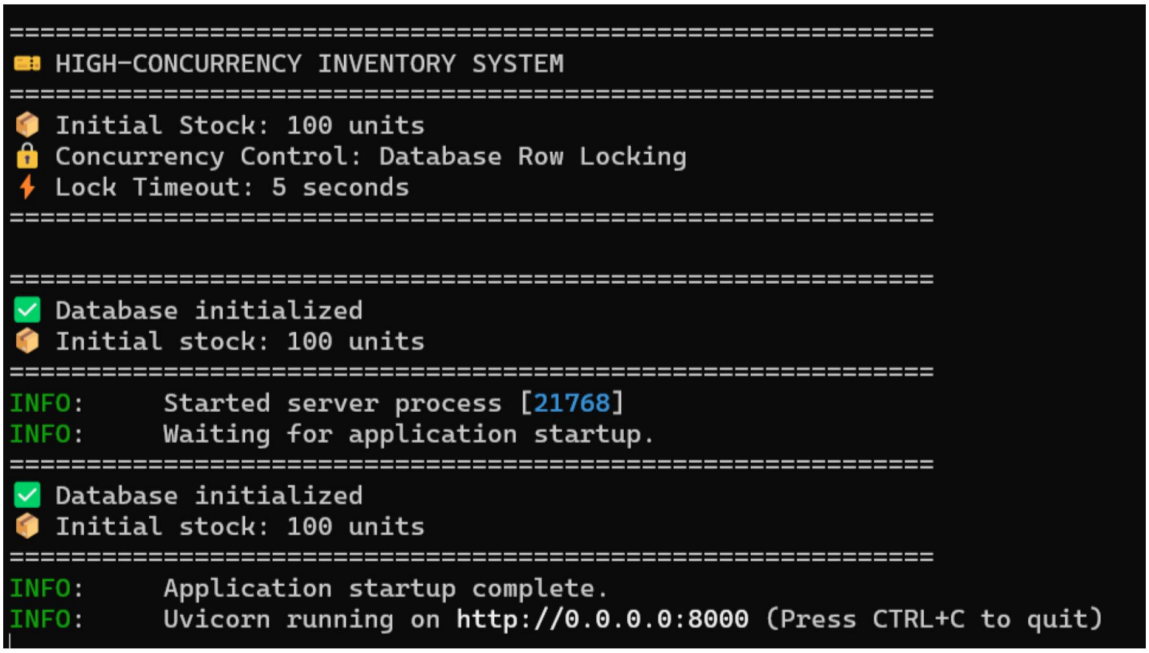
RUNNING THE APPLICATION

Step 1: Start the Server

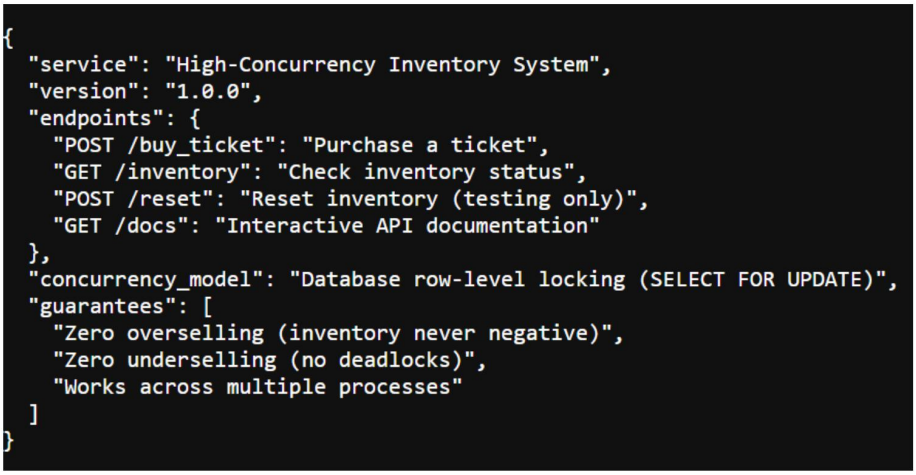
python firehose_collector.py



Step 2: Test with Your Browser

Test 1: Check API is alive

http://localhost:8000



Test 2: Check inventory

In browser: http://localhost:8000/inventory


```
{
  "item_id": 1,
  "item_name": "Item A - Concert Ticket",
  "current_stock": 100,
  "initial_stock": 100,
  "total_purchases": 0,
  "last_updated": "2026-01-15 12:30:27"
}
```


RUNNING THE PROOF OF CORRECTNESS

```
C:\Users\SARVAGYA SANJAY\Desktop\InventorySystem>python proof_of_correctness.py

============================================================
🎫 INVENTORY SYSTEM - PROOF OF CORRECTNESS
============================================================

This script proves that the inventory system:
1. Prevents overselling (no negative inventory)
2. Prevents underselling (no deadlocks)
3. Works correctly with high concurrency
4. Works across multiple processes

⏳ Checking if server is running...
 Server is running!

============================================================
TEST 1: BASIC CONCURRENCY (100 buyers, 100 tickets)
============================================================
 Inventory reset to 100 units
 Launching 100 concurrent purchase attempts...

 RESULTS:
   Total time: 4.25s
   Successful purchases: 100
   Sold out responses: 0
   Errors: 0
   Average response time: 2059.84ms

📦 FINAL INVENTORY:
   Current stock: 0
   Total purchases: 100

 VERIFICATION:
   ✓ All 100 purchases succeeded
   ✓ Final inventory is 0
   ✓ Database has exactly 100 purchase records

 TEST 1 PASSED!
```

```
============================================================
TEST 2: OVERSELLING PREVENTION (1000 buyers, 100 tickets)
============================================================
 Inventory reset to 100 units
 Launching 1000 concurrent purchase attempts...
   (This simulates a flash sale with high contention)
   Progress: 100/1000
   Progress: 200/1000
   Progress: 300/1000
   Progress: 400/1000
   Progress: 500/1000
   Progress: 600/1000
   Progress: 700/1000
   Progress: 800/1000
   Progress: 900/1000
   Progress: 1000/1000

 RESULTS:
   Total time: 41.26s
   Throughput: 24.24 requests/second

   Successful purchases: 100
   Sold out responses: 900
   Server busy responses: 0
   Errors: 0

   Response times:
     Average: 2052.64ms
     Min: 2022.03ms
     Max: 2099.55ms

 FINAL INVENTORY:
   Current stock: 0
   Total purchases in DB: 100

 VERIFICATION:
   ✓ Exactly 100 purchases succeeded
   ✓ All 1000 requests accounted for
   ✓ Final inventory is 0 (not negative!)
   ✓ Database has exactly 100 purchase records
   ✓ NO OVERSELLING (inventory never went negative)

 TEST 2 PASSED! No race conditions detected!
```

```
============================================================
TEST 3: MULTIPLE PROCESSES (4 processes, 250 attempts each)
============================================================
 Inventory reset to 100 units
 Launching 4 processes...
   Each process will attempt 250 purchases
```

TEST SUMMARY

Basic Concurrency, Overselling Prevention, and Multiple Processes: PASSED

The inventory system is CORRECT:
Zero overselling (inventory never negative)
Zero underselling (no deadlocks)
Thread-safe under high concurrency
Process-safe across multiple servers

The system is production-ready for flash sales.