Coding Exercise: Conway's Game of Life API

Target Language/Framework:

C# using .NET 8.0 (net8.0)

Objective:

Implement a RESTful API for Conway's Game of Life. Your solution should be designed with production readiness in mind. Reference:
https://en.wikipedia.org/wiki/Conway%27s_Game_of_Life

Functional Requirements:

The API should include (at a minimum) the following endpoints:

x, y
x, y
x, y
x, y

Serialize/deserialize
Text

1. Upload Board State Post
   - Accept a new board state (2D grid of cells).
   - Return a unique identifier for the stored board.

2. Get Next State get
   - Given a board ID, return the next generation state of the board.

3. Get N States Ahead get _
   - Given a board ID and a number N, return the board state after N generations.

4. Get Final State delete
   - Return the final stable state of the board (i.e., when it no longer changes or cycles).
   - If the board does not reach a stable conclusion within a reasonable number of iterations, return a suitable error message.

Non-Functional Requirements:

- The service must persist board states so they are not lost if the application is restarted or crashes. DB
- The code should be production-ready:
  - Clean, modular, and testable
  - Includes appropriate error handling and validation
  - Follows C# and .NET best practices
- You do not need to implement authentication or authorization.

API
Service
DB

Evaluation Criteria:

- Correctness – Does the API behave as described?
- Code Quality – Is the code clean, well-structured, and maintainable?
- Design & Architecture – Are design decisions well thought out? Is the code extensible?
- Production Readiness – Is the service robust and resilient?

- Discussion Readiness – Be prepared to walk us through your design and decisions in a follow-up discussion.

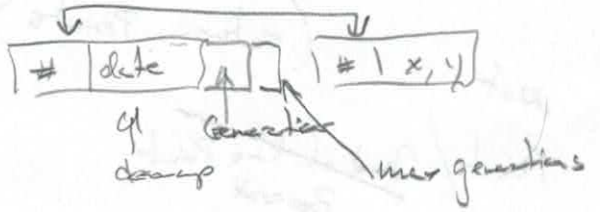
Estimated Time:

This exercise may take 4–5 hours. Manage your time appropriately. We are more interested in quality and thorghtful design than in a perfect or overly complex implementation.

Once you've completed the exercise, please upload your code to a GitHub repository (or a similar platform like GitLab or Bitbucket) and share the link with us. You're also welcome to include any notes or documentation you'd like us to review.

- Base project
- Controller ← swagger / Auth ???
- Service Layer ← DI
- Data layer

DB design Readme.com



Services
load DB
Save DB

Live Cells
Dead Cells

34 million

~~Process point~~

Count neighbours
live cell transition
dead cell transition

tick or return generation(ticks) ← test for still life
beehive
Loaf
Boat
tub
blinker
Toad
Beacon
etc.

✓ Points

✓ Fix Expires In X Days

✓ Finish Doc

✓ Fix Error Messages

Refactor Services

Project

Conways Game Of Life

Build Basic

~~Dummy Controller~~

– Add dummy service

– Swagger

– DB, Data

- Discussion Readiness – Be prepared to walk us through your design and decisions in a follow-up discussion.

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Point

GameOfLife

Point

method CountNeighbors (~~Dead~~ Potential Live Cells) also resets Potential ~~Dead~~ Dead Cells ~~Reset~~ ~~Potential~~ ~~Dead cells~~

Init Seeds (Livecells) resets (Dead cells)

Transition only works if CountNeighbors executed will do this automatically

(return Points)

Point / ~~Game of Life Point~~ Board .Net

Ozero or max # not exceeded.

- Configuration for Service
- Test for population change to end with point test???
- Test w/Acorn

R-pentomino

1, 0
0, 2
1, 2
1, 3
2, 3

End

Breaking Points

R-pentomino 1103

Diehard

1,0 5,0 6,0 7,0
0,1 1,1
6,3

8 1
6 2
8 1
6 2

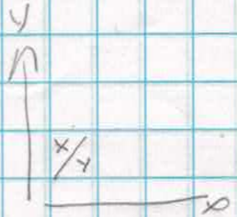
Acorn

0,0 1,0 4,0 5,0 6,0
3,1
1,2

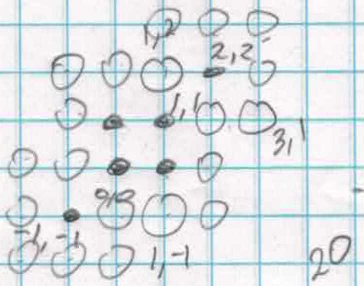
initial
Count

Single step
2
3
4
8

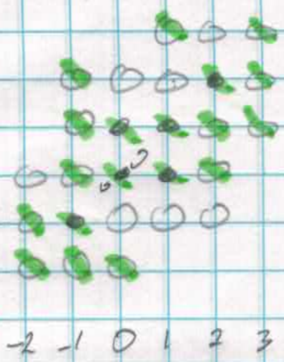
Previous Population[] { }



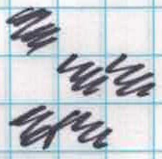
- Scan for all 8 surrounding cells
    - count live cells
    - add dead cells to list
        to scan later
    - based on live cell count
        < 2 remove cell (underpopulat
        > 3 remove cell (overpopulatio



- scan



Glider

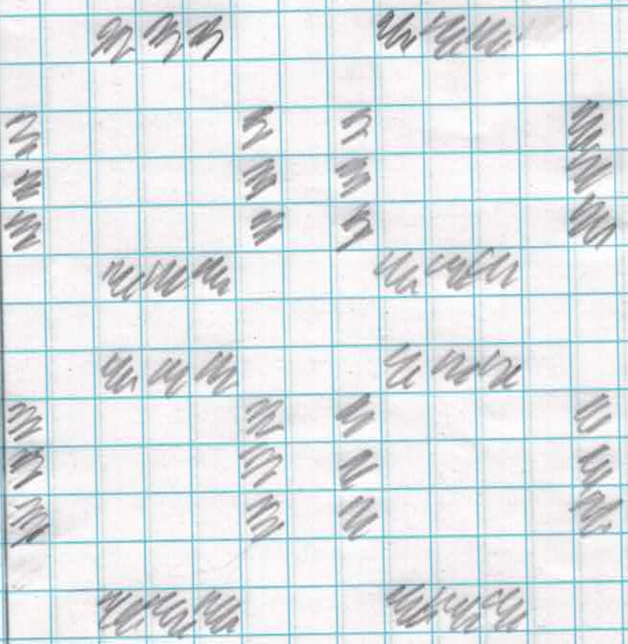


Testing Count

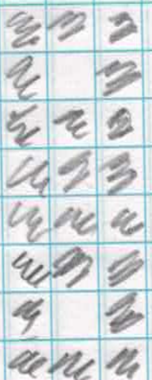
```
1 2 3          -1/1 0/1 1/1
8 ▨ 4      < 2 -1/0 0/0 1/0
7 6 5          -1/-1 0/-1 1/-1

1 1 2
4 ▨ 2      = 2      for -1 to 0
4 3 3               for
                      -1 to 0
41 1 12               not 0/0
4 ▨ 2      = 3
4
3 3 3²

1 1 1
2 ▨ 1      > 3
2 2 2
```

also test >, 4, 5, 6, 7,

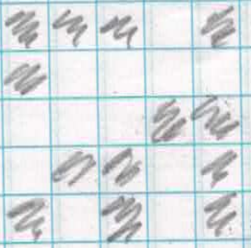
Pulsar



Pentadecathlon



-infinite-



or