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:

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

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

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

4. Get Final State
   - 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.
- 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.

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 thoughtful 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.