



SmartClass

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sddec25-10

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01 SmartClass Mission

SmartClass' Mission

- **Empower educators and students** by bridging communication gaps in large lecture settings
- **Strengthen classroom relationships** through enhanced interaction tools
- **Increase student engagement** with real-time feedback mechanisms
- **Develop a scalable platform** to support diverse educational environments

What is SmartClass?



What are we creating?

- An interactive classroom platform that connects students and teachers
- Real-time polling and Q&A system for immediate feedback
- Interactive lectures activities to ensure student engagement
- Discussion space that persists beyond class time
- Analytics dashboard for tracking student engagement

Who are our intended users?

- Students
 - Shy - Doesn't like to ask questions
 - Confused - Professor went to fast through content
- TA
 - Wants to help students in/outside of the class
- Professors
 - Large classroom
 - Wants to make lectures engaging
 - Wants feedback

Development Style



- Agile Workflow
 - Weekly faculty advisor meetings
 - Weekly meeting with all team members
 - Decided what needed to be implemented & what needed change



- Sprint Work Week
 - 1 week long sprints
 - Utilized Linear for organization



- Collaborative Environment
 - All ideas valued and considered

02

SmartClass Design

Initial Mockups

- Lectures
 - Upload lecture notes and follow along
 - Take in-class quizzes
 - Live-Chat feature with anonymous mode
 - Chat saved for future reference

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COMS:352 | 02/14/25 9:30AM - 10:20AM:
Live View:

Recap

Paging

- Address space and Physical memory are divided into equal-size units: pages and frames
- A page table (mapping from VPNs to PFNs) for each process
- Translation:

The diagram illustrates the address translation process. At the top, a 'Virtual Address' is shown as a 7-bit binary sequence: 0 1 0 1 0 1. The first four bits (0 1 0 1) are labeled 'VPN' and the last three bits (1 0 1) are labeled 'offset'. Below the Virtual Address, an 'Address Translation' box is shown. A blue double-headed arrow labeled 'Page Table' points to the left of this box. Arrows point from the four VPN bits down to the first four bits of a 'Physical Address' sequence: 1 1 1 0 1 1. The first four bits (1 1 1 0) are labeled 'PFN' and the last two bits (1 1) are labeled 'offset'. A speech bubble on the right says 'Incoming Quiz...'.

Jessica: What does VPN mean?
Mark (Prof): Virtual Page Number
Mark (Prof): What is the Big-O of this function?

Initial Mockups

- Quizzes

- Test knowledge on the fly
- Create quizzes for use during lecture
- Formats
 - Multiple choice
 - Fill in the blank
 - True/False
 - Short Answer

The screenshot displays the SmartClass web application interface. At the top, a blue header bar contains the 'SmartClass' logo on the left, a user profile with a small avatar and the text 'Hello, Kelly' with a dropdown arrow in the center, and a 'Sign Out' button on the right. Below the header is a dark blue navigation bar with white text links: 'Home', 'Live Classes' (with a red 'Live' indicator), 'Chat', 'Schedule', 'People', 'Support', 'Search', and 'About'. The main content area has a light gray background and displays the course and session information: 'COMS:352 | 02/14/25 9:30AM - 10:20AM:'. Below this, a 'Live View:' section is visible. The quiz content is presented in a white box with a black border. It contains three questions, each with multiple choice options. Question 1 asks about memory allocation schemes and fragmentation. Question 2 asks about dynamic memory allocation in heap segments. Question 3 asks about virtual addresses and page numbers. At the bottom right of the quiz area, there are small diagrams: a vertical stack of two boxes labeled 'page 0' and 'page 1', and a horizontal row of two boxes labeled 'frame 0' and 'frame 1'.

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COMS:352 | 02/14/25 9:30AM - 10:20AM:

Live View:

1. For each of the following memory allocation schemes explain why it does or does not experience external fragmentation or internal fragmentation.

- ☐ a. Base and bounds
- ☐ b. Segmentation
- ☐ c. Paging

2. Most systems allow a program to allocate more memory to its address space during execution. Allocation of data in the heap segments of programs is an example of such allocated memory. What is required to support dynamic memory allocation in the following schemes?

- ☐ a. Base and bounds
- ☐ b. Segmentation
- ☐ c. Paging

3. For each of the following virtual addresses, compute the page number and offset when using 4KB pages.

- ☐ a. 22,000
- ☐ b. 77,056
- ☐ c. 197,012

Diagram illustrating memory layout:

- page 0
- page 1
- frame 0
- frame 1

Initial Mockups

- Personal Profile
 - Join Classes
 - Review previous lectures/quizzes
 - See upcoming classes

SmartClass

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Upcoming Lectures:

COMS:352 | 02/14/25 9:30AM - 10:20AM:
SE:421 | 02/14/25 10:30AM - 11:20AM:
COMS:352 | 02/17/25 9:30AM - 10:20AM:

(View more...)

Previous Lectures:

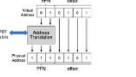
SE:419 | 02/13/25 2:00PM - 4:00PM:

Lecture Notes:

Recap

Pages

- Address space and Physical memory are divided into equal size units: pages and frames
- Address translation: from VPNs to PFNs in each process
- Translation:



Process

Virtual	Physical
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10

Translation

Virtual	Physical
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10

Concern

Each process has its own page table which the OS stores in frames in physical memory

Linux page size is 8KB, on 32bit we saw the address space is 1GB
~17 million page table entries for every process!

Linux reduces size with multi-level (3-level tree structure) page tables

Page table lookup is slow, every memory access requires additional memory accesses! How to speed up memory?

L10: Translat

Jessica: What does VPN mean?
Answer: Virtual Page Number
Henry: What does PFN mean?
Answer: Physical Field Number

Tony: Is this on the Exam?

Quizzes:

1. For each of the following memory allocation schemes explain why it does or does not experience external fragmentation or internal fragmentation.

- Base and bounds
- Segmentation
- Paging

2. Most systems allow a program to allocate some memory to its address space during execution. Allocation of data in the base segment of a program is an example of static allocation. What is required to support dynamic memory allocation in the following schemes?

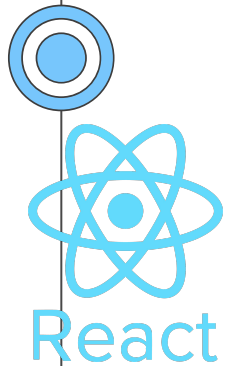
- Base and bounds
- Segmentation
- Paging

3. For each of the following virtual addresses, compute the page number and offset when using 4KB pages.

→ 0x1000

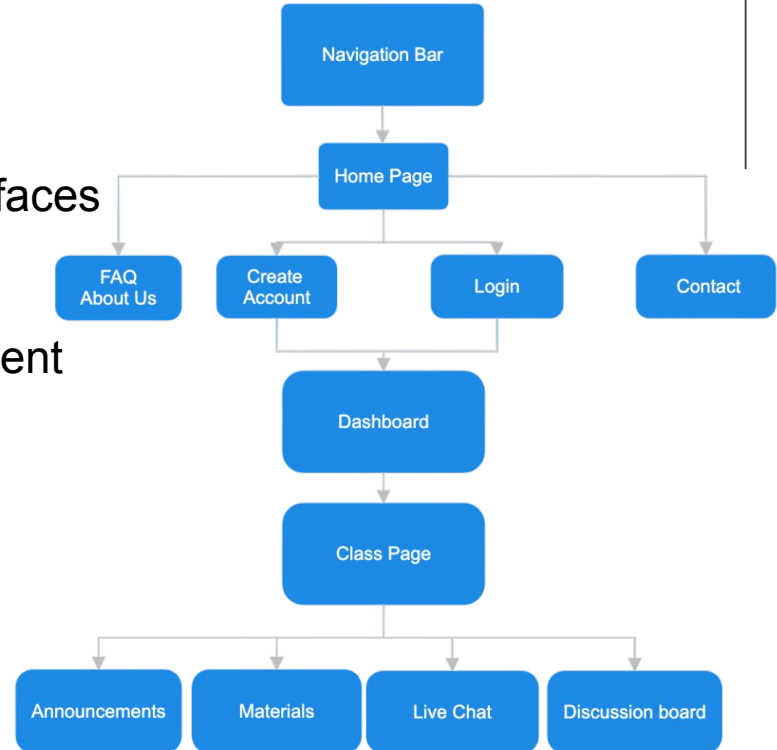
Score: (8 / 10)

10



Frontend

- React JS
 - Component based
 - Reduced redundancy
 - Dynamic and Interactive interfaces
- Page hierarchy
 - Login to enter class
 - Navigation Bar is always present



Backend



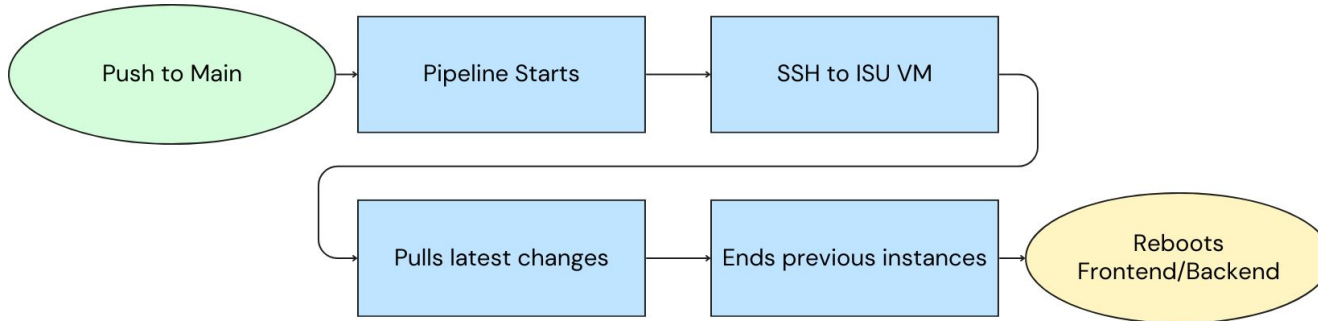
- Java & Spring Boot
 - Our backend code is written in Java.
 - Spring Boot for its web development features, security, authentication, and automated tests.
 - We utilize Maven for managing dependencies.



- MySQL
 - We use a MySQL server hosted on our own dedicated server.
 - MySQL allows us to appropriately design complex relationships and perform difficult queries.

CI/CD

- GitLab CI/CD
 - Autonomous deployment
 - Utilizes YAML file to run scripts
 - The deployment script follows these actions



Design

Course Creation
and Management

Live Polling and
Questions

Anonymous Question
Submission

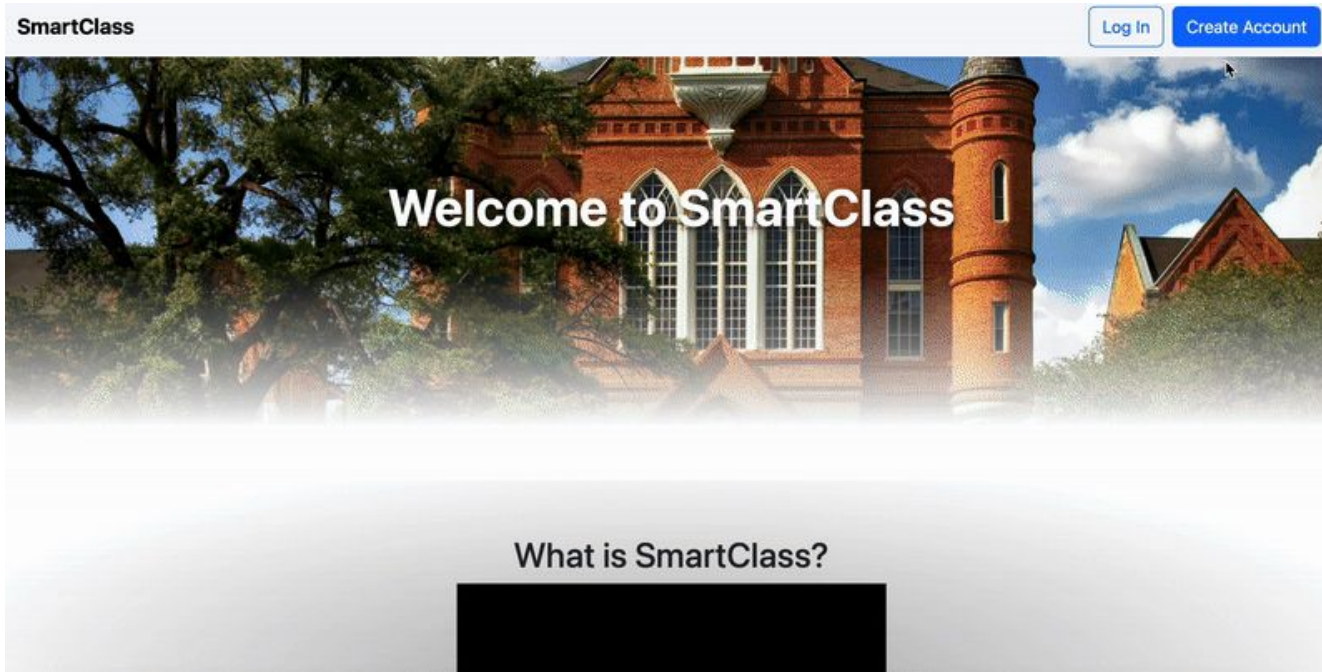
Class Material
Distribution

Student Participation
Tracking

In-Class Discussion
Forum

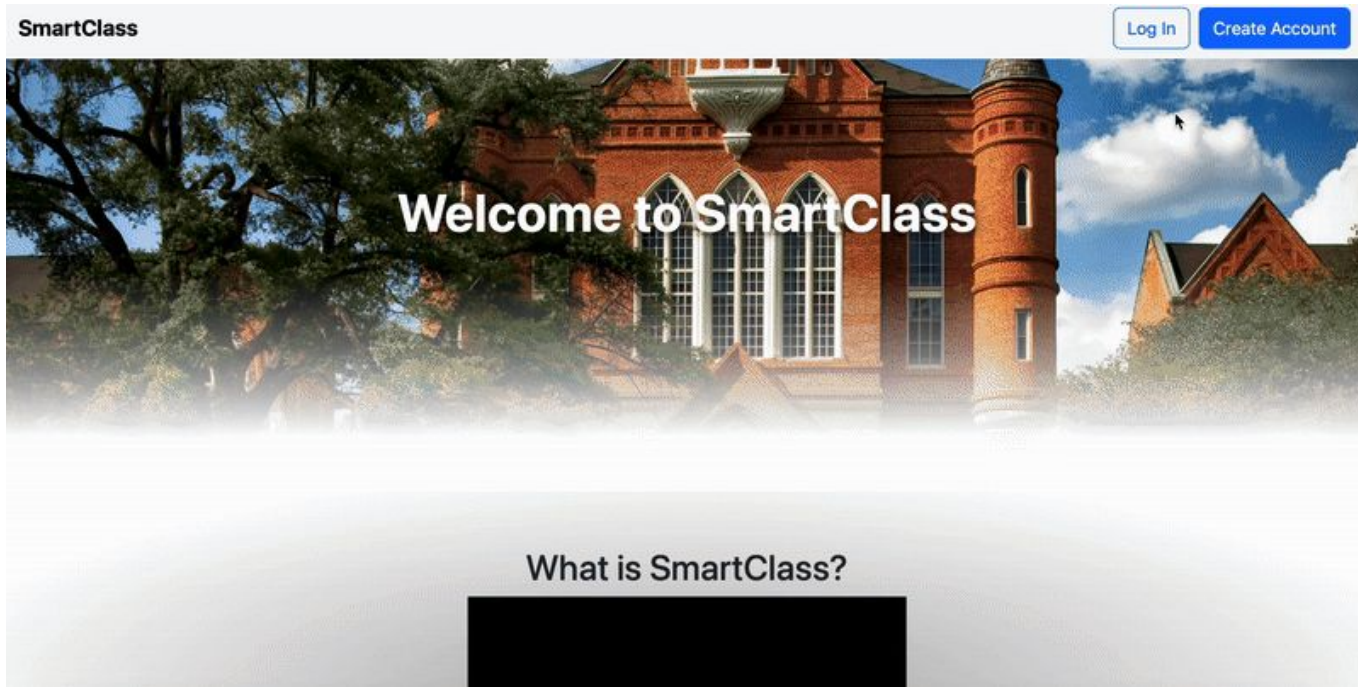
Current Features

- Create Account (Teacher and Student)



Current Features

- Sign in



Current Features

- Create Class



Current Features

- Join Class



Current Features

- Live chat (including anonymous mode)



Current Features

- Discussion Forum
 - GIF to be added

Future Features

- Add Quizzes to live-chat
- Check lecture quiz grades/materials
- Live Lecture Recording
- Uploading lecture notes
- Whiteboard

Non-Functional Requirements

1. Performance
2. Reliability
3. Scalability in terms of number of users
4. Compatibility

Testing/Security

Unit Testing

Frontend

- React Testing Library
- Jest

Backend

- Database Queries
- Spring Boot
- JUnit

```
import {render, screen} from '@testing-library/react'
import userEvent from '@testing-library/user-event'
import '@testing-library/jest-dom'
import Fetch from './fetch'

test('loads and displays greeting', async () => {
  // ARRANGE
  render(<Fetch url="/greeting" />)

  // ACT
  await userEvent.click(screen.getByText('Load Greeting'))
  await screen.findByRole('heading')

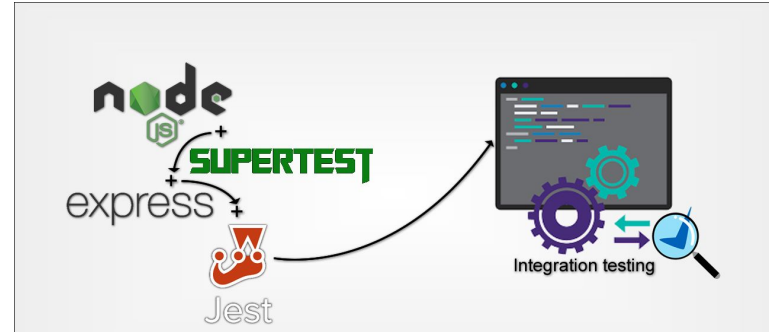
  // ASSERT
  expect(screen.getByRole('heading')).toHaveTextContent('hello there')
  expect(screen.getByRole('button')).toBeDisabled()
})
```



Integration Testing

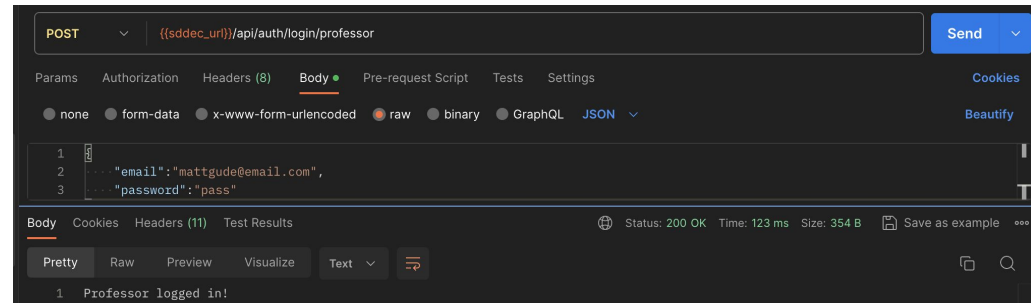
Frontend:

- Supertest



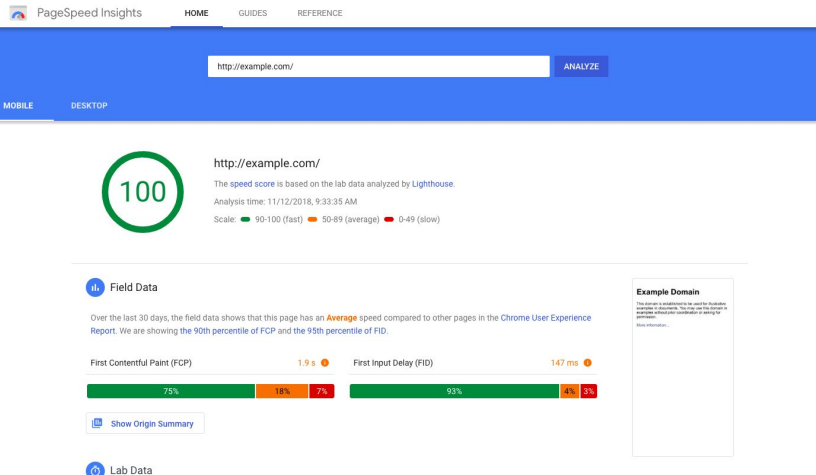
Backend:

- Postman to Test APIs
- CI/CD - automated tests on gitlab pipeline



Performance Testing

- Load Testing - Simulate expected user load
- Stress Testing - Simulate beyond expected user load to see limits
- UI Load Testing - See if website is fast & responsive
- Browser-Based Load Testing - Ensuring website works on different browsers





Usability Testing



- Focus on two main user groups:
 - Students
 - Teachers
- How will it be tracked?
 - Post-Test Survey: Quick feedback on usability (Google forms)
- Get feedback/suggestions

Student Feedback

We're gathering feedback on the usability of the SmartClass learning platform. Your input will help us improve the student experience.

Name (Optional)

Short answer text

What device did you use for testing?

☐ Laptop

☐ Tablet

Security Measures

Authentication & Access Control

- Passwords hashed with BCrypt
- JWT used for login and session validation
- Role-based access controls (Student, TA, Instructor)

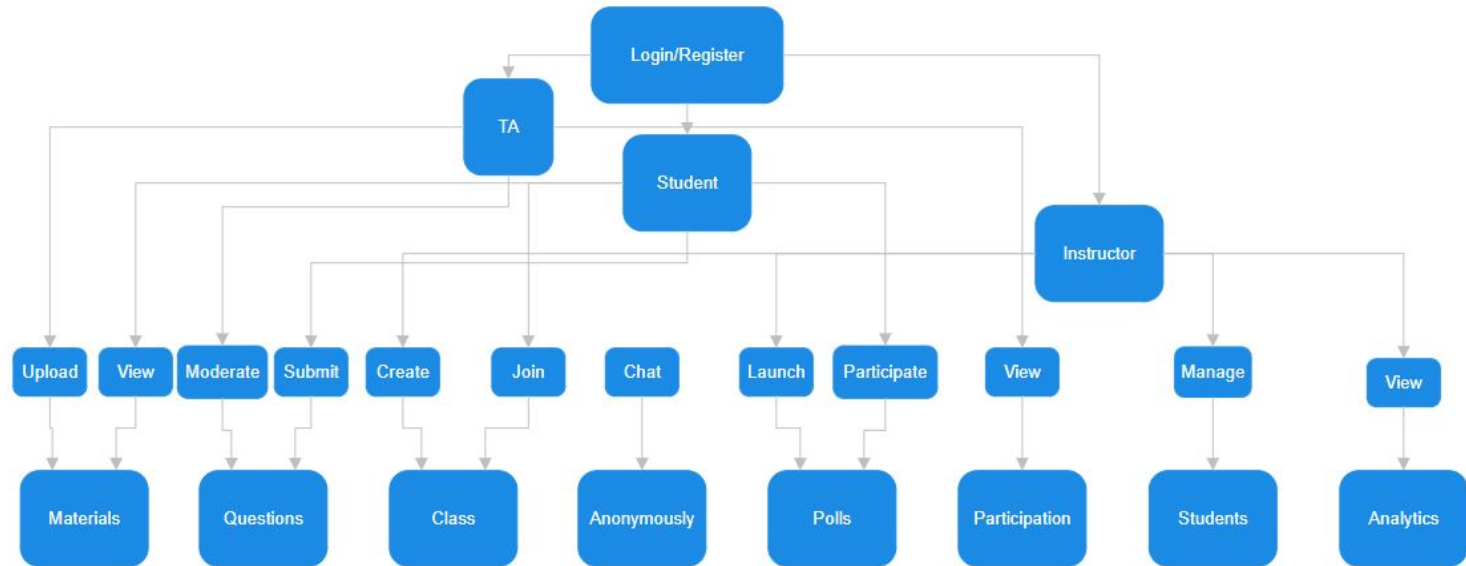
Data Protection

- CORS configured to block unauthorized origins
- Input validated via DTOs
- Only required data exposed in responses

Backend SafeGuards

- Secured with Spring Security filters
- API endpoints require valid token
- Permission checks on class/forum access

Use-Case Diagram



Conclusion

SmartClass

Interactive Learning Tool

Design

React Application using
Spring Boot/MySQL

Future

Implement Live-Lecture
functionalities

GIFs (copy/paste if needed)

