17-723: Designing Large-scale Software Systems

Interface Design Exercise

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This Lecture

- Response to your Feedback
- Overview of Milestone 3
- Interface Design for the Project
- Outlook towards Milestone 4

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Your Feedback!

Instructors are "responsive and patient to answer questions in class or slack." ☺

"The instructors is enthusiasm and encouragement and make me feel happy to join the class." ☺

Exit tickets provide effective practice for students to summarize the lecture, and an opportunity for students to resolve confusions. ☺

Examples in class provide students with concrete applications of design principles. ☺

Encouraging students to participate with **chocolate** rewards is effective. ☺

In-class discussions help students more deeply think about the course material. ☺

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Your Feedback!

Providing students with **code samples or templates** for the project will allow them to **focus on the design elements** and less on the front-end development.

➢ Thanks for the feedback! We will do this next year!

➢ Feel free to ask for support on Slack

➢ **Pair Programming** (two developers coding at one laptop, one typing the other one talking) can help you get up to speed faster with a new framework

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Your Feedback!

“Some of what we are taught is too abstract and high-level. Can give more concrete tactics”

The focus on principles is useful but you may want to provide a few concrete **guidelines or best practices** to students for them to take into professional contexts.

➢ We will try to include more concrete “**design recipes**” in future lectures

➢ Keep in mind that design cannot always be reduced to step-by-step instructions (otherwise ChatGPT / GitHub Copilot could do it). Experience with many examples will teach you more than following concrete steps that someone has laid out for you

➢ Most concrete guidelines typically apply to specific domains or scopes; principles are more widely applicable and long-lasting!

Your Feedback!

The **project** (develop a web application) may **not feel aligned** to the topic of the course (**systems design**) for some students who do not have domain knowledge required for the project

➢ We will make the **connection** between the project milestones & course topics more clear

➢ In the project you will experience **making design decisions** in large-scale systems and **experience the consequences of your decisions** (this is why we let you implement it rather than just draw it)

➢ More on this today

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Recall Interface Specifications

Syntactic View	Describe document format, the actions that can be performed, their parameters, and outputs.
Semantic View	Describe the purpose / meaning of the resource / action: • **Side-effects**: Changes to the state of a resource or environment • **Usage restrictions**: Who can perform this action? • **Error Handling**: What errors can occur and why? • **Examples**: Examples of outputs for a given input

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OpenAPI GET Specification Example

```yaml
paths:
 /users/{userId}:
   get:
     summary: Returns a user by ID.
     parameters:
       - name: userId
         in: path
         required: true
         description: Parameter description in CommonMark or HTML.
         schema:
           type : integer
           format: int64
           minimum: 1
     responses:
       '200':
         description: OK
```

Lets you generate server stub code for many languages and **generate HTML documentation**

See https://swagger.io/docs/specification/basic-structure/

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OpenAPI POST Specification Example

```
paths:
  /users:
   post:
     summary: Creates a user.
     requestBody:
       required: true
       content:
         application/json:
           schema:
             type: object
             properties:
               username:
                 type: string
     responses:
       '201':
         description: Created
```

Lets you generate server stub code for many languages and **generate HTML documentation**

See https://swagger.io/docs/specification/basic-structure/

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Example Interface Specification (GDS from Interoperability Lecture)

Add-on: **`(price, name, description, id)`**

- **`price(int):`** The price in cents (excl. tax) additionally charged when this add-on is selected
- **`name(str):`** The name of the add-on as shown to the user (in UTF-8)
- **`description(str)`**: A short description shown to the user in order to decide if they want to purchase the add-on (in UTF-8)
- **`id(str):`** Unique identifier of this add-on starting with the flight number (in ASCII)

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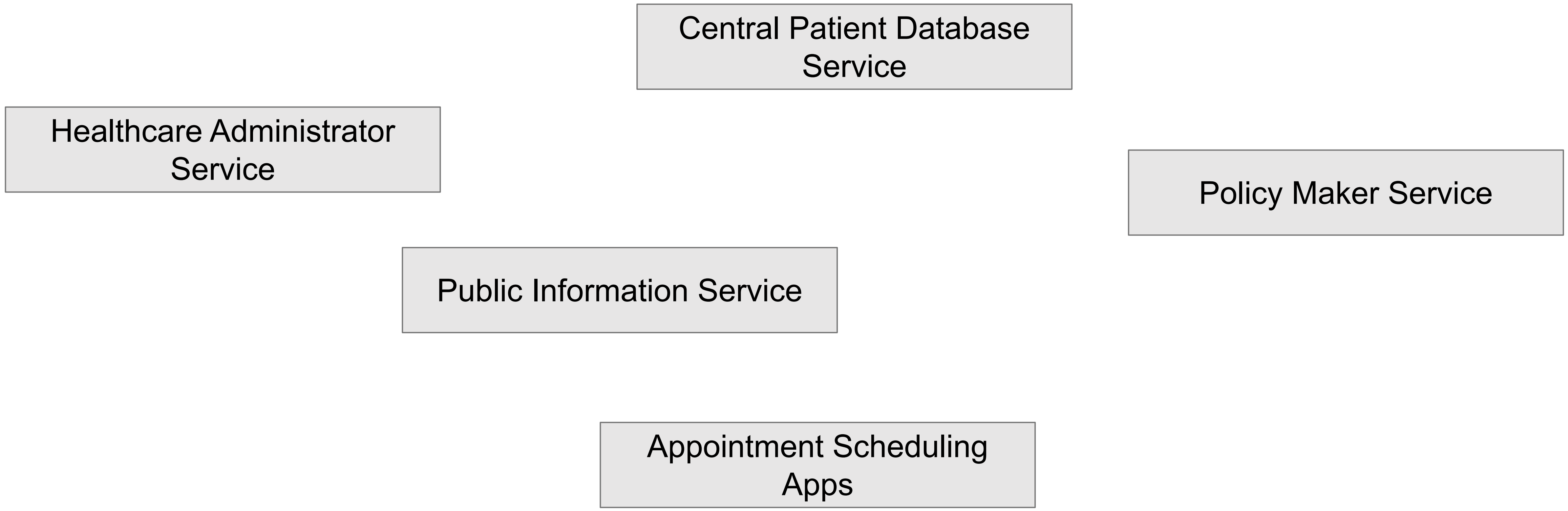
Responsibility Assignment


Central Patient Database Service
Healthcare Administrator Service
Policy Maker Service
Public Information Service
Appointment Scheduling Apps

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What Data Needs to be Exchanged?

Test Reporting

Quarantine Recommendations

API Design Exercise

Design a first draft of your team's APIs (syntax) in the Shared Document.

Teams for the Test Reporting & Quarantine Recommendations:

-> Create OpenAPI specification

Then meet with other teams to give each other feedback!

API Design Exercise: Semantics

Meet in your Project Groups to **update the syntax** of the your API and **add descriptions of the semantics**.

Semantic View

Describe the purpose / meaning of the resource / action:

- **Side-effects**: Changes to the state of a resource or environment
- **Usage restrictions**: Who can perform this action?
- **Error Handling**: What errors can occur and why?
- **Examples**: Examples of outputs for a given input

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Project Tasks

- Design your Service's API **by the end of Thursday Mar 14** and document it in the shared Google Docs Document
- Comment on the APIs of other Teams to ensure consistency