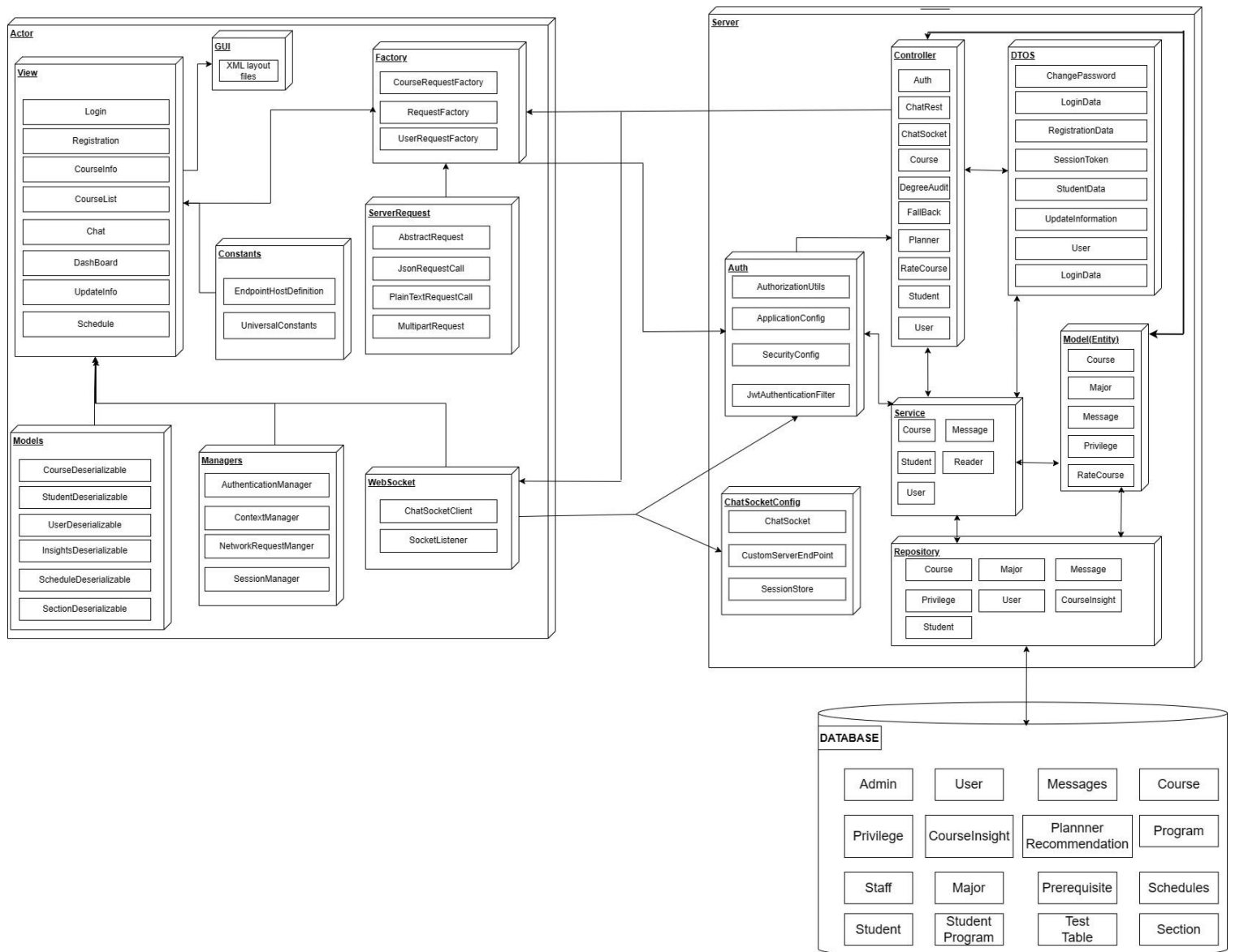

Design Document for <<Scheduler>>

Group <lg-112>

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Frontend - underlying hidden architecture:

```

classDiagram
    class Cluster3 {
        CourseRequestFactory
        PlainTextRequestCall
        RequestFactory
        UserRequestFactory
        RequestCallS_R
        AbstractRequestResponseType_RequestType
        JsonRequestCall
    }
    class Cluster2 {
        CourseListActivity
        CourseCardComponent
        InflatableComponentT
        SectionCardComponent
        SectionDeserializeable
        CourseDeserializeable
        CourseInfoActivity
        InsightsDeserializeable
        UpdateInfoActivity
        MainActivity
        LoginActivity
        RegisterActivity
        AbstractActivity
    }
    class Cluster11 {
        ChatActivity
        SocketListener
        ChatSocketClientS
        AuthenticationManager
        ContextManager
        NetworkRequestManager
        SessionManager
    }
    class Cluster10 {
        StudentDeserializeable
    }
    class Cluster9 {
        EndpointHostDefinition
    }
    class Cluster5 {
        ScheduleBlockAdapter
        ScheduleDeserializeable
    }
    class Cluster1 {
        ElementHelpers
    }
    class Cluster8 {
        DeserializationHelpers
    }
    class Cluster7 {
        ChatDeserializeable
    }
    class Cluster4 {
        UniversalConstants
    }
    class Cluster6 {
        Helpers
    }
    class Cluster13 {
        AuditUploadActivity
        MultipartRequest
    }
    class Cluster12 {
        DashboardActivity
        UserDeserializeable
    }

    Cluster3 --> Cluster2
    Cluster3 --> Cluster11
    Cluster2 --> Cluster11
    Cluster2 --> Cluster10
    Cluster2 --> Cluster9
    Cluster2 --> Cluster5
    Cluster2 --> Cluster1
    Cluster2 --> Cluster8
    Cluster2 --> Cluster7
    Cluster2 --> Cluster4
    Cluster2 --> Cluster6
    Cluster2 --> Cluster13
    Cluster2 --> Cluster12

    CourseRequestFactory --> RequestFactory
    UserRequestFactory --> RequestFactory
    RequestFactory --> PlainTextRequestCall
    RequestFactory --> JsonRequestCall
    RequestFactory --> AbstractRequestResponseType_RequestType
    PlainTextRequestCall --> RequestCallS_R
    JsonRequestCall --> RequestCallS_R
    AbstractRequestResponseType_RequestType --> RequestCallS_R

    CourseListActivity --> AbstractActivity
    CourseCardComponent --> InflatableComponentT
    InflatableComponentT --> SectionCardComponent
    SectionCardComponent --> SectionDeserializeable
    SectionDeserializeable --> AbstractActivity
    CourseDeserializeable --> AbstractActivity
    CourseInfoActivity --> AbstractActivity
    InsightsDeserializeable --> AbstractActivity
    UpdateInfoActivity --> AbstractActivity
    MainActivity --> AbstractActivity
    LoginActivity --> AbstractActivity
    RegisterActivity --> AbstractActivity

    ChatActivity --> SocketListener
    ChatSocketClientS --> SocketListener
    AuthenticationManager --> SessionManager
    ContextManager --> SessionManager
    NetworkRequestManager --> SessionManager
    SessionManager --> AbstractActivity
  
```

The diagram illustrates the architecture of the 'Study' application, organized into 13 clusters. Cluster 3 (top) contains factories and request classes. Cluster 2 (middle) contains the core activity and component hierarchy. Cluster 11 (bottom middle) contains management classes. Other clusters (1, 4, 5, 6, 7, 8, 9, 10, 12, 13) contain utility and data classes.

- Cluster 3:** Contains `CourseRequestFactory`, `PlainTextRequestCall`, `RequestFactory`, `UserRequestFactory`, `RequestCall<S, R>`, `AbstractRequest<ResponseType, RequestType>`, and `JsonRequestCall`.
- Cluster 2:** Contains `CourseListActivity`, `CourseCardComponent`, `InflatableComponent<T>`, `SectionCardComponent`, `SectionDeserializeable`, `CourseDeserializeable`, `CourseInfoActivity`, `InsightsDeserializeable`, `UpdateInfoActivity`, `MainActivity`, `LoginActivity`, `RegisterActivity`, and `AbstractActivity`.
- Cluster 11:** Contains `ChatActivity`, `SocketListener`, `ChatSocketClient<S>`, `AuthenticationManager`, `ContextManager`, `NetworkRequestManager`, and `SessionManager`.
- Cluster 10:** Contains `StudentDeserializeable`.
- Cluster 9:** Contains `EndpointHostDefinition`.
- Cluster 5:** Contains `ScheduleBlockAdapter` and `ScheduleDeserializeable`.
- Cluster 1:** Contains `ElementHelpers`.
- Cluster 8:** Contains `DeserializationHelpers`.
- Cluster 7:** Contains `ChatDeserializeable`.
- Cluster 4:** Contains `UniversalConstants`.
- Cluster 6:** Contains `Helpers`.
- Cluster 13:** Contains `AuditUploadActivity` and `MultipartRequest`.
- Cluster 12:** Contains `DashboardActivity` and `UserDeserializeable`.

Relationships include inheritance (solid arrows), associations (solid arrows with multiplicity), and creation (dashed arrows with «create»).

- Activities and components:**

Each activity inherits the parent "AbstractActivity" class, which provides a unified implementation for various functionalities that are frequently used within activities. A component is any layout that is meant to be inflated during runtime (e.g. course entries, section entries), the "InflatableComponent" class enforces a common procedure to build and inflate these components.

```

classDiagram
    class DashboardActivity
    class LoginActivity
    class UpdateInfoActivity

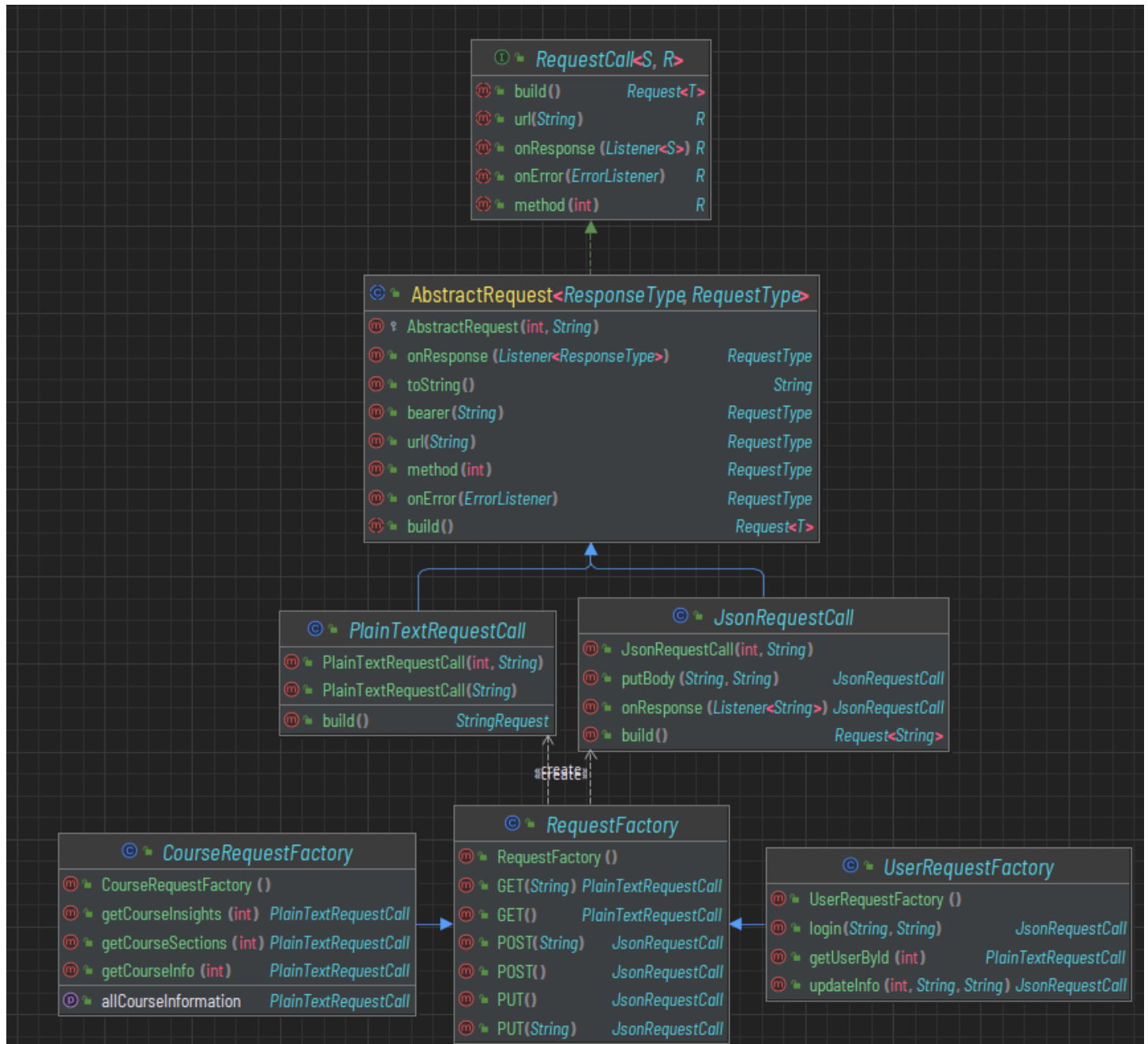
    DashboardActivity --|> UpdateInfoActivity
    LoginActivity --|> UpdateInfoActivity
  
```



Activities and components' object hierarchy and dependency graph

- Requests and request factories:

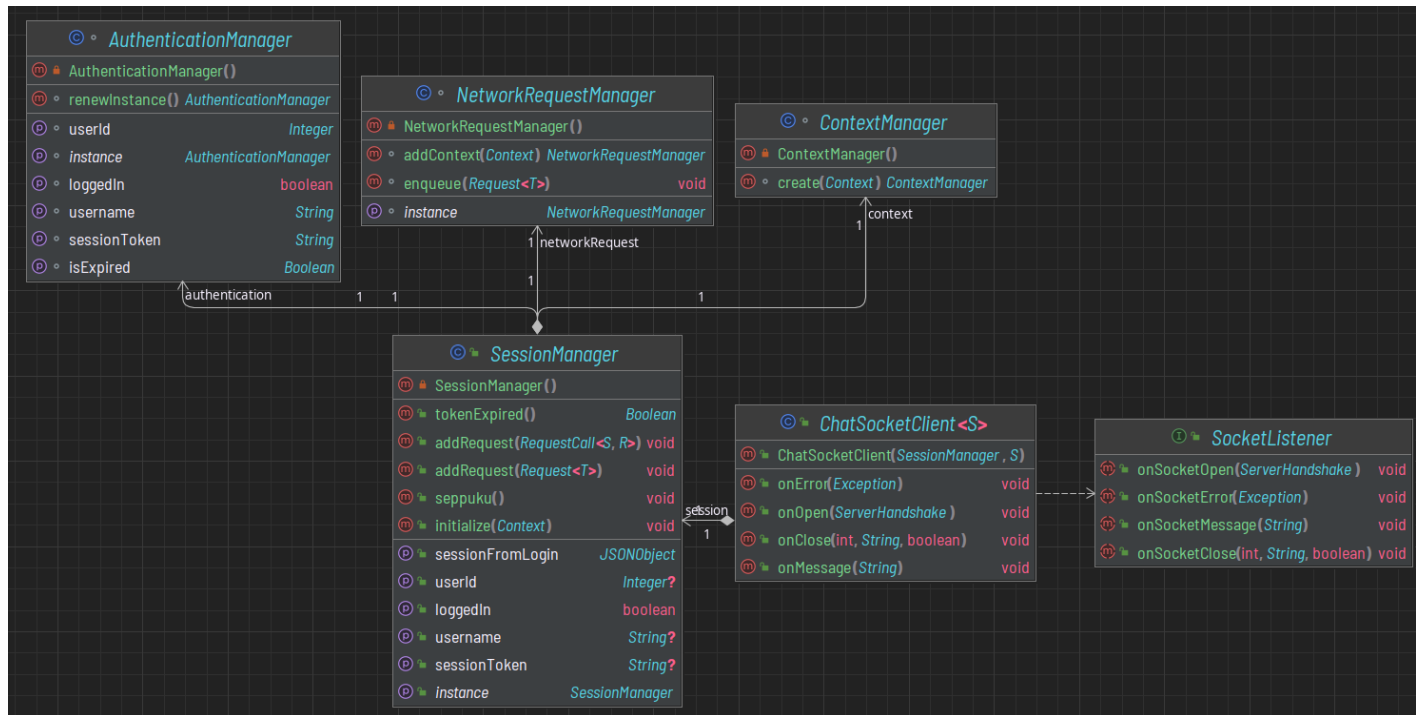
Requests in the frontend application are wrapped with a builder pattern to mitigate developer mistakes and improve maintainability. It also provides a nicer programming interface compared to Volley's. Request factories take in a set of predefined parameters and return a fully filled out request. Additionally, it handles authentication during API calls, and also tries to ping every possible backend host address upon startup to try to guess the host that is being used at the moment.



Requests and their factories' object hierarchy and dependency graph

- Manager singletons:

Managers are singletons that hold states that are crucial to operations throughout various aspects of the application (for example, the current session, user information, the request queue, etc.). Of the handful of singletons each designated to one set of tasks, only “SessionManager” is public and exposed to other aspects of the application, whereas the other classes are package-private. As it is injected into “AbstractActivity”, every activity can access and interact with various states of the application, greatly simplifying the code.



Various singletons and their dependencies

- Deserializables:

These are just data classes (Java records) that have extra attached factory methods that take in a JSONObject and return the corresponding data class. This is a more elegant way to deserialize JSON strings, with a cleaner programming interface to carry out routine deserialization operations such as type validation, data validation, nullish coalescence, array deserialization, etc.

(I know that this section is supposed to be one page, but most of the occupied space are the images and the text can easily fit in one page) (make it font size 6xd)

Backend - JWT authorization

The backend enforces an authorization system based on JSON web tokens. A JWT token is generated with all the necessary claims whenever a user logs in. All future requests to the backend server must also include this token in order for the request to be served. The token includes a claim for the user ID, allowing the backend to serve the correct data and validate whether the user has sufficient privileges to carry out certain actions.

Before the requests reach the Controller, it has to pass the JWT Authorization Filter, which will take the token from the request header "Authorization", decode the token, extract the claim username, and then check by calling the UserService to see whether there is that username in the database or not. If satisfied, it will let the request reach the Controller. Otherwise, it will return 403 Forbidden in the status.

Database Schema

