

CLINIC MANAGEMENT SYSTEM - DESIGN & IMPLEMENTATION REPORT

1. Collection Choices and Justifications

A. Patient Management: HashMap<Integer, Patient>

- **Usage:** Used in ClinicManagementSystem to store all patients.

- **Justification:** The most frequent operation is looking up a patient by their ID (e.g., during appointment scheduling). HashMap makes it easy and faster data retrieval.

B. Doctor Management: ArrayList<Doctor>

- **Usage:** Used in ClinicManagementSystem to store the list of doctors.

- **Justification:** The number of doctors is expected to be relatively small compared to patients.

C. Appointment Management (Whole System): TreeMap<String, ArrayList<Appointment>>

- **Usage:** Stores appointments based by date (String "YYYY-MM-DD").

- **Justification:** Reporting requirements often involve generating daily schedules. TreeMap automatically keeps the keys sorted naturally allowing generating reports in chronological order without sorting.

D. Appointment Management (Specific Patient): TreeMap<String, Appointment>

- **Usage:** Inside the Patient class to store their personal schedule.

- **Justification:** Similar to the whole system record, it is beneficial to keep a patient's history sorted. The key is a composite string of "Date Time" to ensure uniqueness and chronological sorting.

E. Medical History: ArrayList<MedicalRecord>

- **Usage:** Inside the Patient class.

- **Justification:** Medical history is a sequential record of events. An ArrayList preserves the insertion order (chronological) and allows for dynamic growth as new records are added.

2. OOP design choices

A. Abstract 'Person' Class

- **Decision:** Created an abstract base class 'Person' containing common attributes (name, email, phone).

- **Benefit:** Reduces code duplication between Doctor and Patient classes and establishes a clear hierarchy

B. Interfaces

- **Decision:** Implemented 'FileOperations' and 'ReportGenerator' as separate interfaces.

- **Benefit:** Decouples the definition of behavior from the implementation.

- **FileOperations** ensures any class implementing it can handle file saving and loading.

- **ReportGenerator** ensures standard reporting capabilities.

This design allows the ClinicManagementSystem to implement multiple specific behaviors while keeping the contracts clear.

C. Composition

- **Decision:** The 'ClinicManagementSystem' is composed of collections of Patients and Doctors, rather than inheriting from them.

- **Benefit:** Properly models the relationships, ensuring better encapsulation and maintainability.