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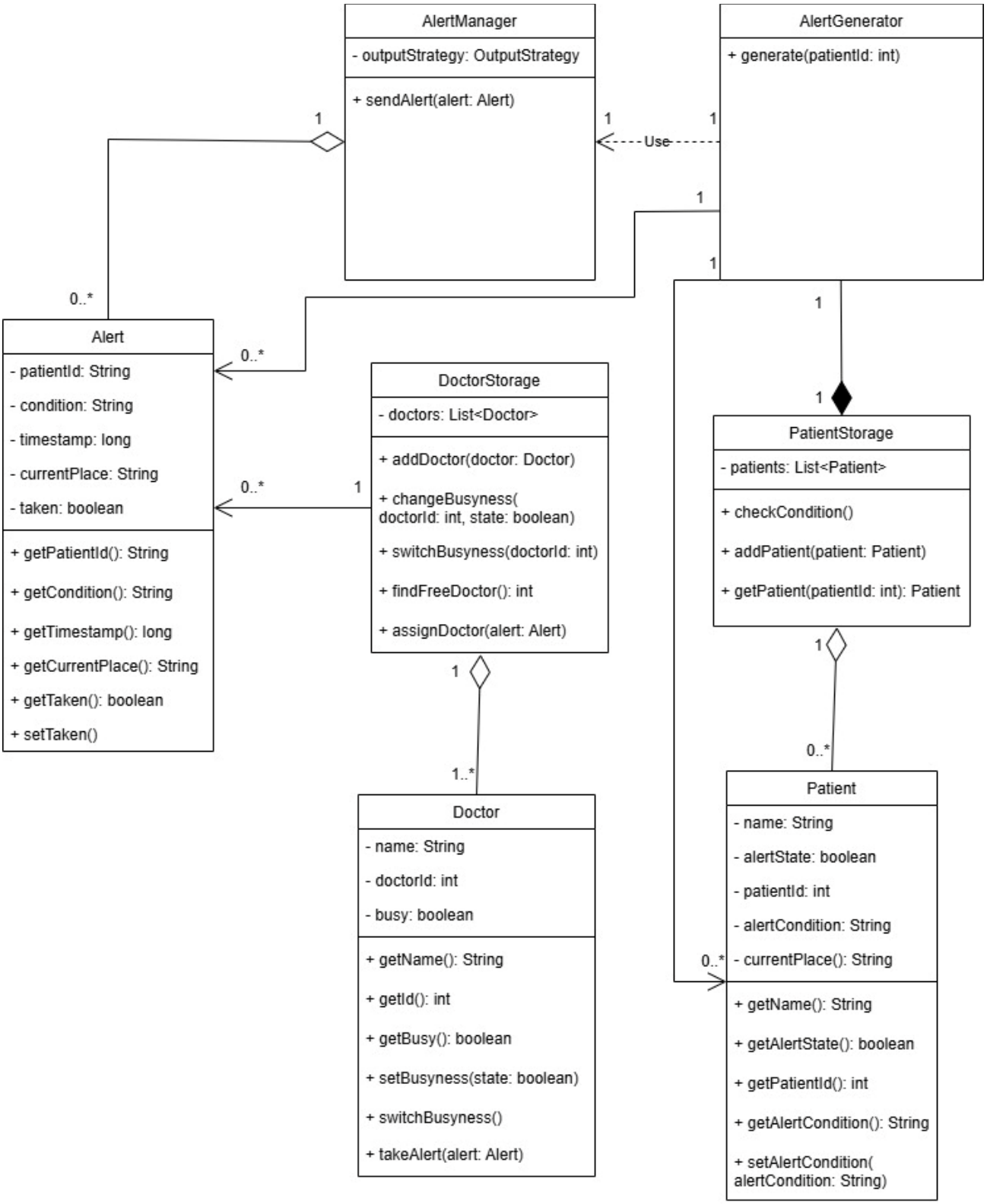
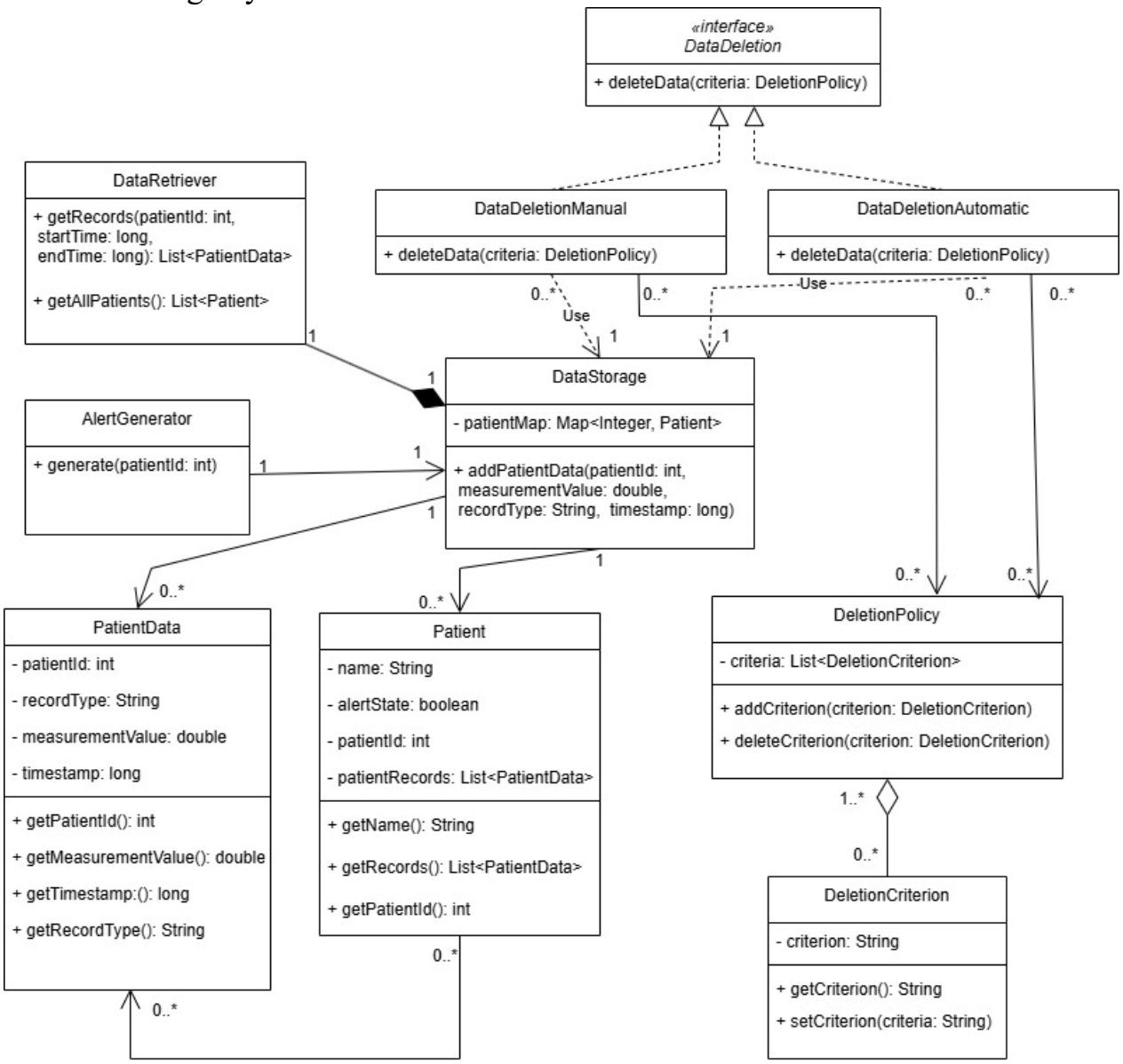
UML Diagrams

1. Alert Generation System



We evaluate each person as an instance of class **Patient**. Each patient has name, *alertState* (if there's an alert situation), *patientId*, *alertCondition* and *currentPlace* of the patient (either room or hall if he's just arrived). In case the patient is totally new, in the constructor it's possible that there will be created new Id automatically. Similarly, *alertCondition* can be set manually or it would be standard as for all new patients. Information about all patients is stored in **PatientStorage** class. It's possible to add new patients to the list using *addPatient* function. The class every second checks conditions of all patients using **AlertGenerator** class. **AlertGenerator** evaluates condition by comparing current condition with *alertCondition* which is accessed using *parientId* through **PatientStorage** and **Patient**. If alert situation is triggered, **AlertGenerator** creates an instance of **Alert** class (*patientId*, *condition*, *current timestamp*, and *place* of patient, *taken* = false) and sends it to **AlertManager** class. **AlertManager** is singleton and dispatches all alerts through the system. It has *outputStrategy* which defines how and where alerts are sent (which server, which type, etc.). As classic example we will assume that all doctors have smart watches connected to a server to which alerts are sent according to *outputStrategy*. **AlertManager** sends alert using *sendAlert* function that the patient needs help. Each doctor is instance of class. All of them are stored in **DoctorStorage**, but generally, when they receive messages, they choose themselves who wants to go to patient. At that point, using *takeAlert* function, state of doctor switches to busy and alert becomes taken (if it wasn't taken yet). When they finish with the patient, they will set their state as free again (*busy* = false). For additional features, **DoctorStorage** provides additional functions for the manager.

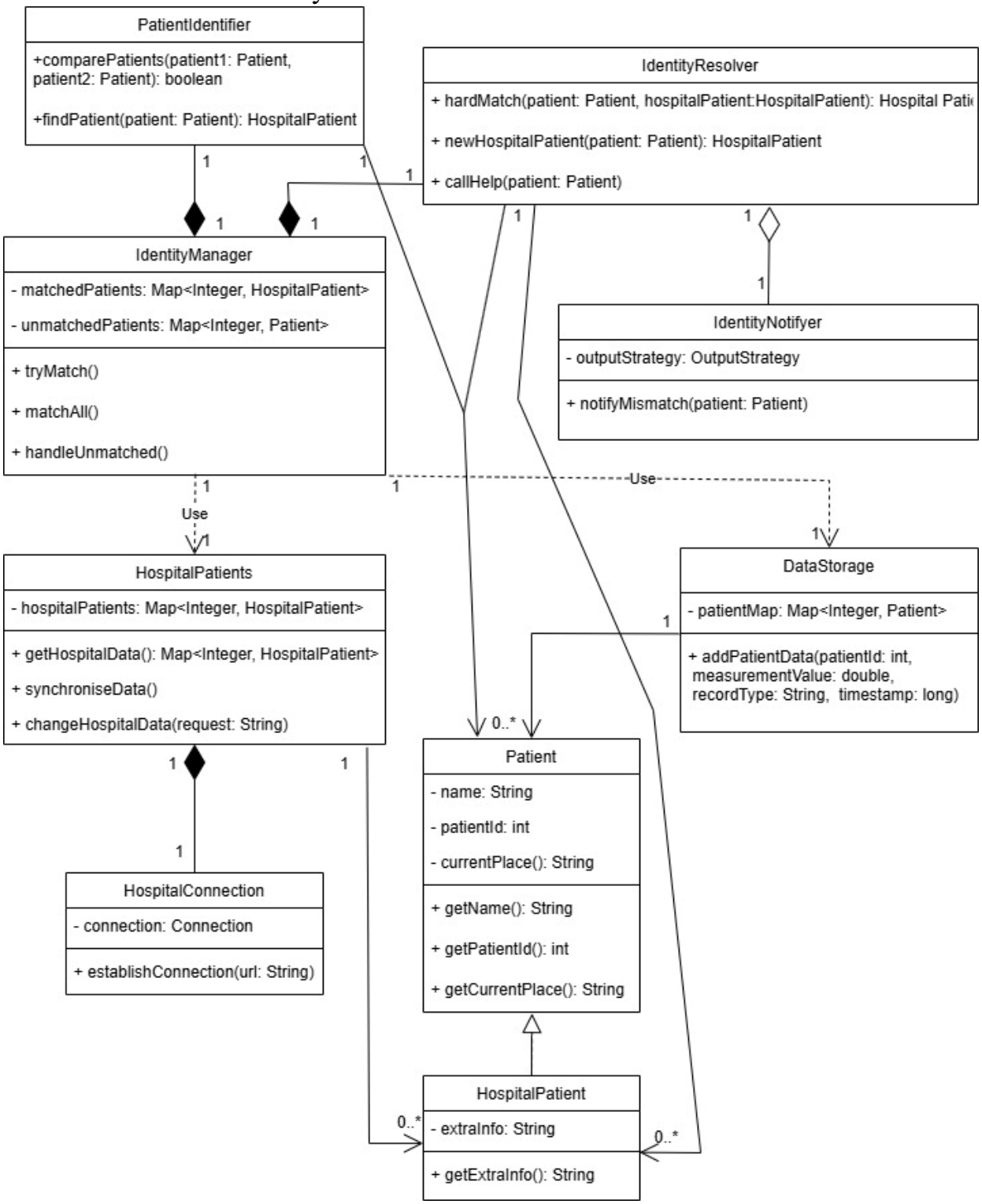
2. Data Storage System



AlertGenerator, discussed in part one, besides getting data and sending alerts, now also sends measurements for storage. It sends them to **DataStorage** class, which is singleton, contains hash table with all patients of the hospital. Using *addPatientData* function, it stores new measurements from **AlertGenerator**, assigned to specific patient. Considering each patient as instance of class, each patient has a list of all his/her records where each record contains *patientId*, *recordType*, *measurementValue*, and *timestamp* (instances of class **PatientData**). To retrieve data, medical staff will refer to **DataRetriever** class, using which it's possible to get list of patients (*getAllPatients*) or list or records of a specific patient (*getRecords*) through **DataStorage** instance. It's important that through this class it's impossible to occasionally delete any information. Now, getting to deletion topic. There is a class **DeletionCriterion**, instances of which can contain a criterion for future deletion. Those

criteria can be stored at instances of **DeletionPolicy** class. Next, there is interface ***DataDeletion*** which is implemented through 2 classes. The first class, **DataDeletionAutomatic**, allows to make criteria which will be automatically regularly checked and to delete data automatically (e.g. delete all data stored later than X days before). The second class, **DataDeletionManual**, allows medical staff to manually delete data in case of special situations (e.g. delete all data on blood pressure for day X because the measure device was broken and always showed wrong results). Hence, I decided that **DeletionPolicy** should not be singleton, so that staff can create different policies for different occasions. We may assume that through GUI, the access to criteria and deletion classes will be restricted to a smaller number of doctors than access to data retriever.

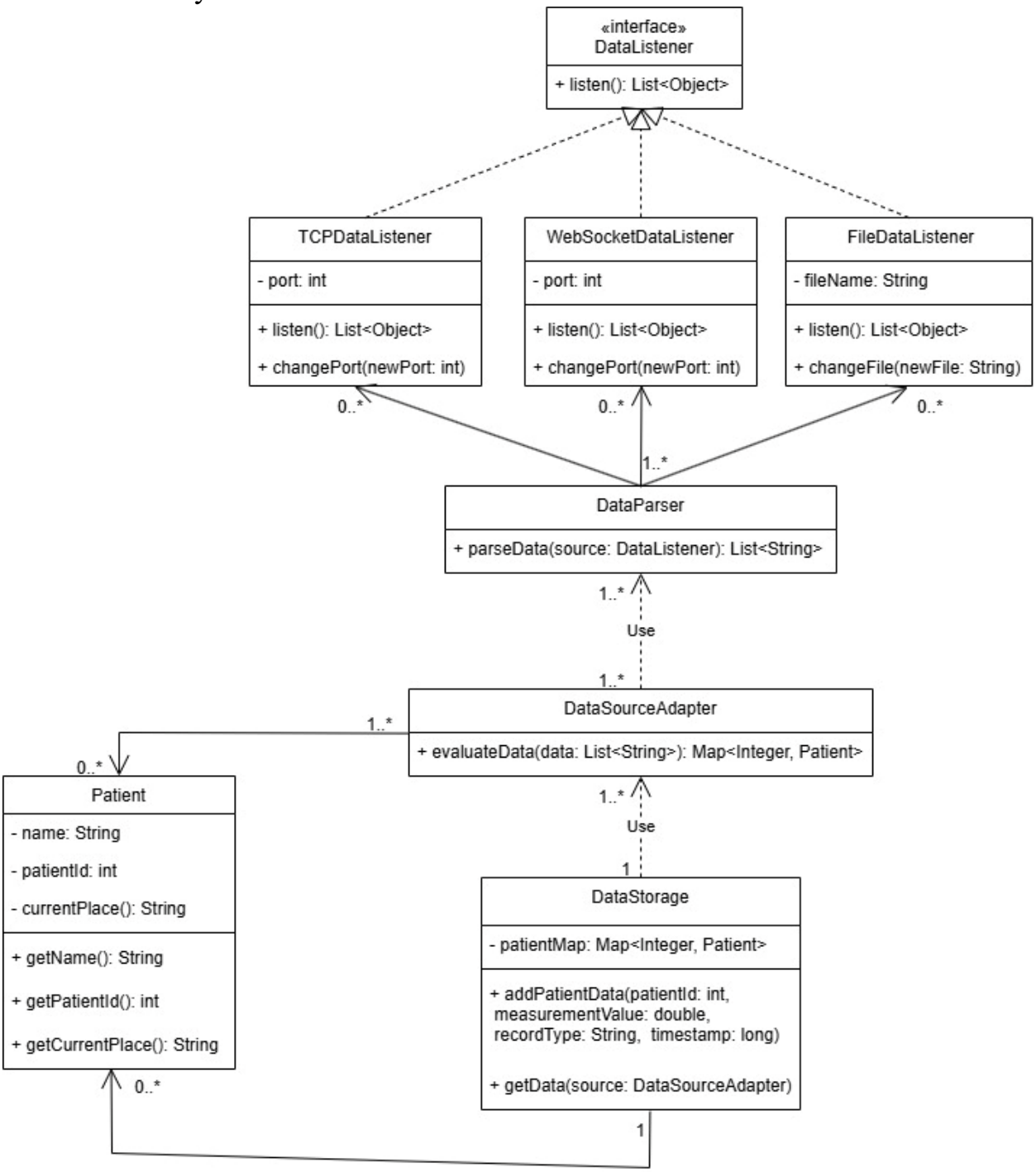
3. Patient Identification System



Using **HospitalConnection** class, we establish connection to a DB of the hospital. We can get data from DB, or change something in that data through **HospitalPatients** class. We save a hash map of all hospital patients. They are stored using **HospitalPatient** class, child of

Patient class. The reason for that is that real hospital patients may have some extra info rather than our simulated data, though they all have *name*, *patientId*, and *currentPlace* (in which room situated or not in hospital). Same as in the previous task, all our simulated data is stored in **DataStorage** class. The main class in this system is **IdentityManager** class. It stores which patients were matched with hospital ones and those who are not. It has *tryMatch* function, using which it tries to find matches with the help of *PatientIdentifier* class. This class can compare automatically data from 2 patients (no need to use *HospitalPatient* type since we have no way to compare extra information) or find a match of a patient in list of hospital patients. Another function is *matchAll*, using which in case of not-match the new hospital patient will be created. Finally, it can try to handle mismatches referring to **IdentityResolver** class. It can either hard match a patient with hospital patient, even if they are not totally same, or create a new hospital patient (used in *matchAll*), or refer to medical staff to resolve this problem. This is done by **IdentityNotifyer** class, which sends a notification about mismatch using *outputStrategy* and the medical staff decides themselves what to do next (e.g. use *hardMatch* from **IdentityResolver**).

4. Data Access Layer



We have an interface ***DataListener*** which assures that all listeners would have a function *listen* to get data from their way of getting information. In our example, we have 3 external data sources: TCP, WebSocket, or input file. As a result of listening, they get list of objects (most generic type). Then, **DataParser** transforms those lists into unified list of Strings where each string is same format and contains information of patients. Using **DataSourceAdapter**, it's easy from that list of strings transform it to map of patients,

which is the way how data is stored in the main **DataStorage**. This system is pretty flexible and doesn't require much changes in case of changes. For example, let's assume we want to add a new way of receiving information. For that, we will need to do only 2 things: create a class to a new listener, and maybe adjust a bit **DataParser**, so that it can transform gotten data into list of strings. Another example is if we assume since now we get more information about patients (e.g. their phone number). For doing that, we again need to change only 2 things: class Patient so that it stores 1 more parameter, and **DataSourceAdapter** which creates instances of **Patient**. As we can see, in each example we don't need to rebuild the whole system again, and most importantly, it doesn't affect the **DataStorage**, so it continues to properly work with other classes, mentioned in the previous UML diagram.