

## TESTING OF eCREAM INTERFACE MODULES

Deliverable Code: D2.2

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Version: Final

Date: 27/08/2024

Dissemination level: PUBLIC

*Project:* eCREAM

enabling Clinical Research in Emergency and Acute care Medicine through automated data extraction

*Call:* HORIZON-HLTH-2021-TOOL-06

*Topic:* HORIZON-HLTH-2021-TOOL-06-03

*Type of action:* HORIZON Research and Innovation Actions

*Grant Agreement no.* 101057726



**Funded by  
the European Union**

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## Introduction

This document details the data extraction module developed as part of WP2 of the eCREAM project, which aims to retrieve essential information from the emergency department's health records and hospital administrative databases. It specifically reports on T2.4, "Interface specifications for the new ED-EHR" (Lead: Astir; Participant: FBK), which involves defining the necessary specifications for integrating the new ED-EHR with the eCREAM components, and T2.5, "Development of interface modules on the eCREAM side" (Lead: Astir).

This document outlines the work completed thus far on the development and testing of the eCREAM interface modules, covering:

- The current state-of-the-art
- Interface specification of the new eCREAM ED-EHR (Emergency Department - electronic health record) with the folder data dictionary
- Mapping with FHIR (Fast Healthcare Interoperability Resources) and FBK's solution
- Development of the eCREAM interface modules
- The initial installation of Astir's data extraction module at the San Giovanni Bosco Hospital of the ASL City of Turin
- Detailed steps regarding the installation of the eCREAM interface software production environment and testing phases.

## 1. Objectives of the WP2

The objective of WP2 is to develop and validate a data extraction tool that retrieves the required information from ED health records (including both the current EHRs and the new ED-EHR) and other hospital administrative databases. Specific objectives of WP2 include:

- analysing the operational and technological environment of participating EDs;
- mapping essential data to address use cases described in Pillar 4 and WP4 with information available in existing EHRs and the new ED-EHR;
- developing and testing modules that interface the eCREAM database with hospital systems.

### 1.1 Purpose of the WP2 tasks

In parallel with T2.3 "Interface Specifications for Existing EHRs", Astir has been developing technical specifications for a tool that interacts with hospital informatics systems to collect data. T2.4 "Interface specifications for the new ED-EHR" focused on creating a data dictionary containing information extracted from hospitals, mapped into FHIR resources needed for implementing the new ED-EHR. Additionally, T2.5 "Development of interface modules on the eCREAM side" concentrated on developing interfaces to interact with third parties to obtain data from the hospitals and transferring them to the NLP training components and central eCREAM system.

The activities of T2.6 "Development of interface modules on the side of hospital systems and technical support" initiated in parallel with those of T2.5. Discussions were held with the San Giovanni Bosco Hospital to plan the first installation of Local eCREAM with two objectives:

1. verify that the installation and hardware requirements are sufficient to perform the tasks required by the data extraction interface;
2. ensure that all the required information is retrievable from the hospital medical records.

T2.5 started earlier than scheduled to create a preliminary solution for the participating hospitals. This early start allowed the team to promptly address data extraction challenges and implement corrective measures, ensuring a flexible solution adaptable to different contexts.

### 1.2 State of the art of tasks 2.4 and 2.5

Astir has focused on drafting specifications to extract meaningful data (both structured and unstructured) for Use Case 1 (UC1), Use Case 2 (UC2), and NLP training from various hospital information systems (ED-EHR, LIS, and RIS). A data dictionary was developed to map the variables required for research with the data available in the information systems. The data dictionary includes:

- **Clinical Data:** For the two subgroups of patients considered (those with dyspnoea or TLoC), extracted from structured and unstructured data from the ED folder and external vertical folders (LIS, RIS, and vertical applications) and collected from notes and documents produced by other applications
- **Logistic Data:** Useful for tracking patient presence in the ED and timing of specific phases (e.g., patient admission, date and time of ED arrival, etc.)
- **Free Text Data:** From notes and report fields.

Discussions with hospital software suppliers were conducted to assess the proposed exchange format and verify the possibility of retrieving necessary information via batch transfers. Specifically:

- Data retrieval from hospitals is conducted through a system that collects information from files in PDF or JSON format
- PDF and JSON files are extracted from hospital medical records and stored locally
- The archived files are then processed by Astir's Local eCREAM module to populate the eCREAM data model.

The initial installation of this module at San Giovanni Bosco Hospital was completed in the third week of June.

Concurrently, FBK has been designing a new ED-EHR, the eCREAM ED-EHR, and mapping the variables with FHIR resources based on Astir's shared data dictionary.

## 2. Interface specification for the new ED-EHR

### 2.1 Analysis of the data dictionary of the new ED-EHR

Data collected from existing medical records and the future ED-EHR will be organised into a uniform eCREAM model.

The first version of the data dictionary, presented in 'Interface Specifications for Existing EHRs', compiled structured clinical and administrative data to be extracted from hospital records.

A revised and enriched version of this data dictionary has since been developed through discussions with suppliers of ED records and RIS and LIS systems.

The data dictionary, which serves as a framework for extracting valuable information from existing hospital records for the eCREAM model, was proposed by Astir as a fundamental element to ensure consistency with the data to be used in the new ED-EHR.

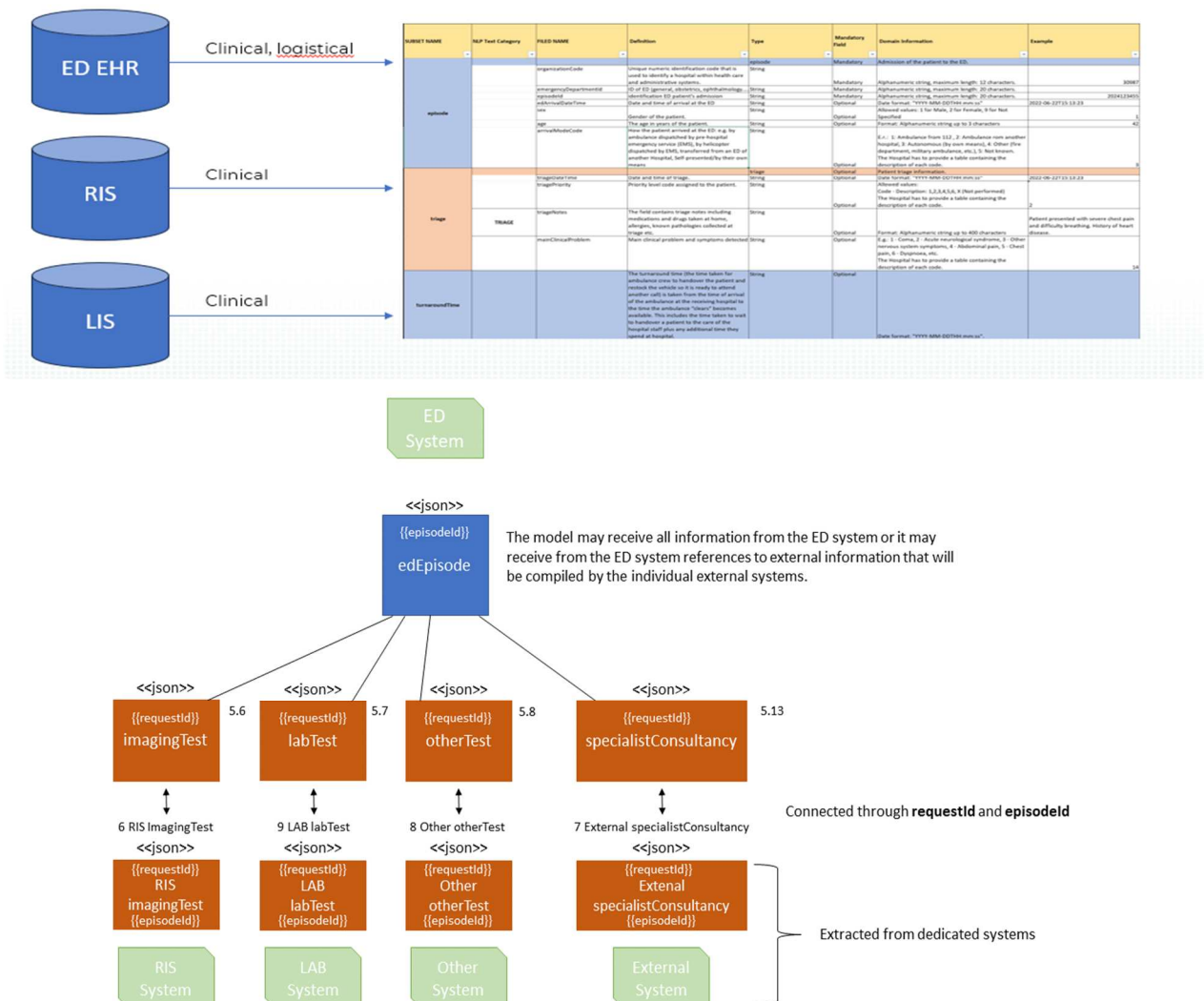
In parallel, activities on T3.3, "Conceptual design of ED-EHR architecture", have progressed. The analysis conducted during this task led to adopting a microservice-based modular architecture, structuring the application as a collection of small, autonomous services designed around specific business domains. Some

of the modules, the so-called *core* microservices, are devoted to implementing key functionalities, such as authentication and authorization, handling personal patient data, and managing clinical data collected during the patient's stay in the ED. Additional microservices will be implemented to address specific ED functionalities such as waiting list management, decision support module, and integration with other information systems with which the new ED-EHR will interact.

Four fundamental microservices have been identified:

- **Authentication:** verifies the identity of users or services, ensuring they are who they claim to be before granting access to resources
- **Authorisation:** determines and grants the appropriate access levels and permissions to authenticated users or services for specific resources or actions
- **Clinical data:** manages and stores medical records and health information following interoperability standards, such as FHIR
- **Patient data:** responsible for the collection, storage, and management of individual patient information.

The *authentication* and *authorisation* modules will ensure that access to the interfaces is granted only to authorised users (individuals or systems) with necessary permissions. The clinical data module will expose [HTTP interfaces as specified by FHIR](#), facilitating the extraction of the data needed by Astir.



FBK used UC1 and UC2 as the basis for defining the data to be managed by the new medical record.

The new medical record will also include data not typically available in hospital medical records (e.g., data stored in narrative rather than structured form). In the eCREAM project, such data will be structured through the intervention of NLP technologies.

## 2.2 Mapping of needed information

Adhering to best practices in using FHIR during the design of an EHR is essential to ensure interoperability, security, and system efficiency. This approach ensures the creation of a robust system that can seamlessly integrate with other healthcare solutions, protect sensitive patient data, and maintain the integrity and quality of health information.

Leveraging FHIR's flexibility and standards was chosen as the strategy to build a system that meets the specific needs of the new ED-EHR, while maintaining compliance with global interoperability standards. FBK mapped the data in the initial data dictionary to available FHIR resources and designed custom resources where necessary.

The figure below (left) illustrates the documentation of one of the core FHIR resources, the *EpisodeOfCare* ([link](#)), which models the relationship between a patient and a healthcare organisation or provider. The structure of the *EpisodeOfCare* resource includes fields that may be specified when the resource is instantiated. Each of them is associated with a type that can either be a reference to another FHIR resource or a specific data type.

Structure			
Name	Flags	Card.	Type
EpisodeOfCare	TU		DomainResource
identifier		0..*	Identifier
status	? ! Σ	1..1	code
statusHistory		0..*	BackboneElement
status		1..1	code
period		1..1	Period
type	Σ	0..*	CodeableConcept
reason	Σ	0..*	BackboneElement
use	Σ	0..1	CodeableConcept
value	Σ	0..*	CodeableReference(Condition   Procedure   Observation   HealthcareService)
diagnosis	Σ	0..*	BackboneElement
condition	Σ	0..*	CodeableReference(Condition)
use	Σ	0..1	CodeableConcept
patient	Σ	1..1	Reference(Patient)
managingOrganization	Σ	0..1	Reference(Organization)
period	Σ	0..1	Period
referralRequest		0..*	Reference(ServiceRequest)
careManager		0..1	Reference(Practitioner   PractitionerRole)
careTeam		0..*	Reference(CareTeam)
account		0..*	Reference(Account)

FHIR - Resource	FHIR - Reference
EpisodeOfCare	<a href="https://www.hl7.org/fhir/episodeofcare.html">https://www.hl7.org/fhir/episodeofcare.html</a>
managingOrganization	<a href="https://www.hl7.org/fhir/organization.html">https://www.hl7.org/fhir/organization.html</a>
careTeam	<a href="https://www.hl7.org/fhir/careteam.html">https://www.hl7.org/fhir/careteam.html</a>
identifier	<a href="https://www.hl7.org/fhir/datatypes.html#Identifier">https://www.hl7.org/fhir/datatypes.html#Identifier</a>
period	<a href="https://www.hl7.org/fhir/datatypes.html#Period">https://www.hl7.org/fhir/datatypes.html#Period</a>
patient	<a href="https://www.hl7.org/fhir/patient.html">https://www.hl7.org/fhir/patient.html</a>
patient	<a href="https://www.hl7.org/fhir/patient.html">https://www.hl7.org/fhir/patient.html</a>
subjectStatus	<a href="https://www.hl7.org/fhir/encounter.html">https://www.hl7.org/fhir/encounter.html</a>

After assessing the needs of the new health record, the variables listed in Annex 4, "Propensity to hospitalize patients from the ED in European centers - Variables to collect: All patients", and Annex 5, "Propensity to hospitalize patients from the ED in European centers - Virtual case report form: Dyspnea and TLOC" attached

to the protocol, were mapped to corresponding FHIR resources, as reported in “Annex 1\_D2.2 - eCREAM variables and FHIR resources mapping”.

Most fields have been successfully mapped to the FHIR resources required to represent the data collected in the new ED-EHR, although some resources require further elaboration. For example, the ‘TurnAroundTime’ field may become part of a larger entity tracking pre-hospital process information, incorporating suggestions made during the design review.

Using FHIR profiles allows for the customisation of standard resources for specific use cases by adding non-standard attributes through extensions while still ensuring interoperability. The entities handling this type of information are currently under analysis.

The FHIR documentation outlines the content of resources and includes the JSON template chosen as the data exchange format with the Central eCREAM platform. For example, the JSON template for the subset named ‘imagingTestList’ is mapped to the corresponding FHIR resource named ‘DiagnosticReport’.

```
{
  "resourceType": "DiagnosticReport",
  // from Resource: id, meta, implicitRules, and language
  // from DomainResource: text, contained, extension, and modifierExtension
  "identifier" : [{ Identifier }], // Business identifier for report
  "basedOn" : [{ Reference(CarePlan|ImmunizationRecommendation|
MedicationRequest|NutritionOrder|ServiceRequest) }], // What was requested
  "status" : "<code>", // R! registered | partial | preliminary | modified | final | amended | corrected | appended | cancelled | entered-in-error | unknown
  "category" : [{ CodeableConcept }], // Service category
  "code" : { CodeableConcept }, // R! Name/Code for this diagnostic report
  "subject" : { Reference(BiologicallyDerivedProduct|Device|Group|Location|
Medication|Organization|Patient|Practitioner|Substance) }, // The subject of the report - usually, but not always, the patient
  "encounter" : { Reference(Encounter) }, // Health care event when test ordered
  // effective[x]: Clinically relevant time/time-period for report. One of these 2:
  "effectiveDateTime": "<dateTime>",
  "effectivePeriod": { Period },
  "issued" : "<instant>", // DateTime this version was made
  "performer" : [{ Reference(CareTeam|Organization|Practitioner|
PractitionerRole) }], // Responsible Diagnostic Service
  "resultsInterpreter" : [{ Reference(CareTeam|Organization|Practitioner|
PractitionerRole) }], // Primary result interpreter
  "specimen" : [{ Reference(Specimen) }], // Specimens this report is based on
  "result" : [{ Reference(Observation) }], // I Observations
  "note" : [{ Annotation }], // Comments about the diagnostic report
  "study": [{ Reference(GenomicStudy|ImagingStudy) }], // Reference to full details of an analysis associated with the diagnostic report
  "supportingInfo" : [{ // Additional information supporting the diagnostic report
    "type" : { CodeableConcept }, // R! Supporting information role code
    "reference" : { Reference(Citation|DiagnosticReport|Observation|Procedure) } // R! Supporting information reference
  }],
  "media": [{ // Key images or data associated with this report
```

```
"comment" : "<string>", // Comment about the image or data (e.g. explanation)

"link" : { Reference(DocumentReference) } // R! Reference to the image or data source
}],

"composition" : { Reference(Composition) }, // I Reference to a Composition resource for the DiagnosticReport structure

"conclusion" : "<markdown>", // Clinical conclusion (interpretation) of test results

"conclusionCode" : [{ CodeableConcept }], // Codes for the clinical conclusion of test results

"presentedForm" : [{ Attachment }] // Entire report as issued
}
```

## 2.3 Definition of the architecture and integration protocols for the new ED-EHR

The FHIR standard also provides guidance for the use and implementation of APIs. The new ED-EHR will provide 'FHIR-compliant' REST APIs to access the data and additional APIs to manage data in real time, updating useful information for UC1.

FHIR is built on RESTful principles, so the API design adheres to RESTful standards using HTTP methods (GET, POST, PUT, DELETE) and associated status codes.

The architectural solution will satisfy security and privacy requirements by implementing robust authentication mechanisms (such as OAuth 2.0) and ensuring that access to resources is authorised according to user roles and authorisations.

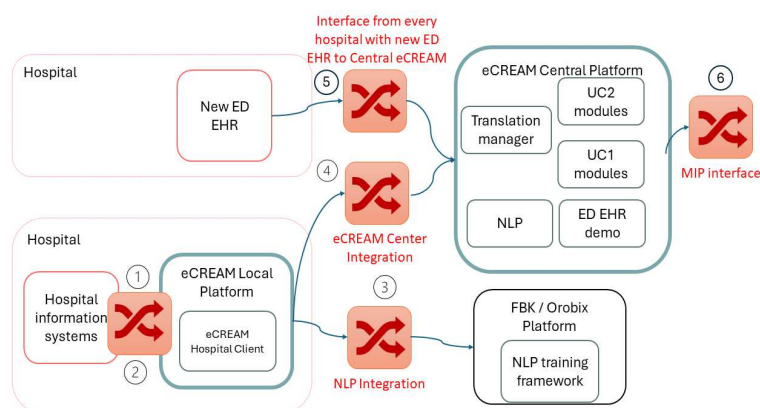
FHIR enables standardised terminologies (e.g., SNOMED-CT, LOINC, ICD-10), facilitating interoperability. FHIR resource optimization also ensures that large volumes of data are handled efficiently by implementing load-balancing strategies to improve system performance and reliability.

## 3. Development of interface modules

The eCREAM platform is composed of a local component and a central component. The local component, known as the eCREAM Hospital Client, features a suite of interfaces designed to extract data from hospital systems and transfer it to both the NLP training and Central eCREAM components. Additional interfaces will be developed for the Central eCREAM platform to connect with the ED-EHR and the Medical Informatics Platform (MIP), which will enable federated data analyses to users outside the consortium.

### 3.1 The architecture of the eCREAM interface module

The following diagram illustrates the integration modules currently under design and development.



Astir's recent efforts have primarily concentrated on implementing the eCREAM Hospital Client component, which handles the data transfer from hospital records to the Local eCREAM component. This component is described in detail within this document, while the other interfaces are described more briefly.

As shown in the diagram above, several interfaces are involved:

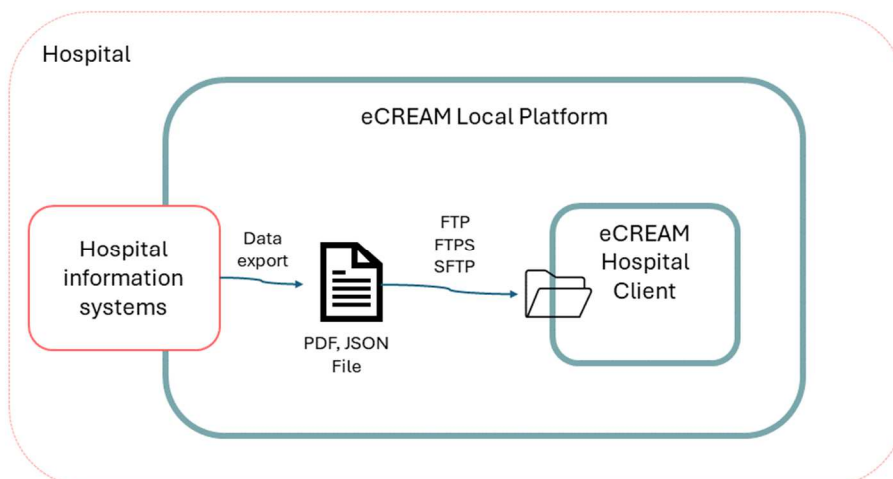
- eCREAM Hospital Client includes the following internal modules:
  - **Integration Job Manager:** Utilises the FTPS channel to retrieve data from hospital systems and transfer it to Local eCREAM (point one)
  - **Web Manager Console:** Provides a web interface for managing operations (point two)
  - **NLP Integration:** Extracts text data from hospital systems and forwards it to the NLP training platform (point three)
  - **eCREAM Centre Integration:** Retrieves data from Local eCREAM in each hospital and transfers it to Central eCREAM (point four)
- Interface between ED-EHR and Central eCREAM (point five)
- Interface between Central eCREAM and MIP (point six).

An authentication module manages interaction among these various components, ensuring their independence. Secure authentication between local and central components of the eCREAM platform is achieved through the HMAC (Hash-based Message Authentication Code) protocol for authenticating API calls.

HMAC uses a hash function with a secret key, allowing for the verification of both the message's integrity and the source's authenticity. Details of this module are documented in 'D6.2 - Report on the Platform Functional Requirements' in the chapter 'Authentication'.

### *Integration job manager*

The following image shows the integration flow, detailing the components involved and the data transfer process:



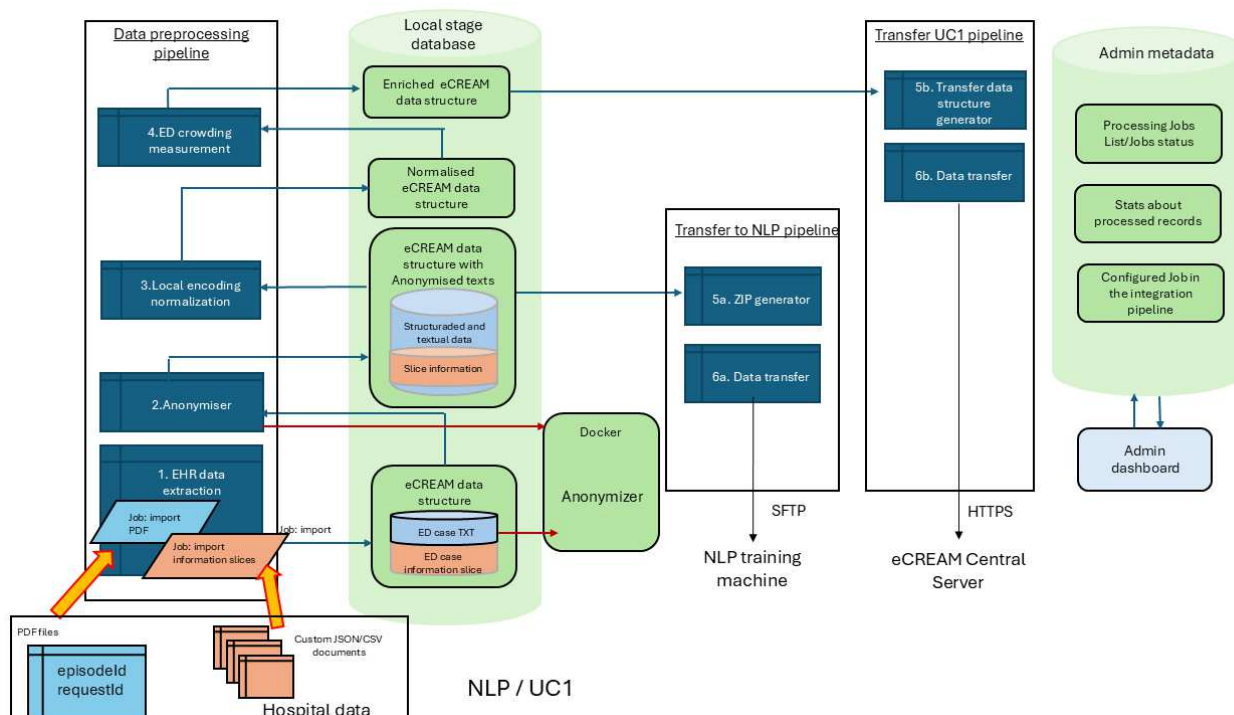
The document 'T2.5 - Development of Interface modules on the eCREAM side,' outlines the development specifications for hospital integration and local platform preprocessing. This included the necessary hardware components hospitals must provide to extract information from medical records. This setup facilitates local

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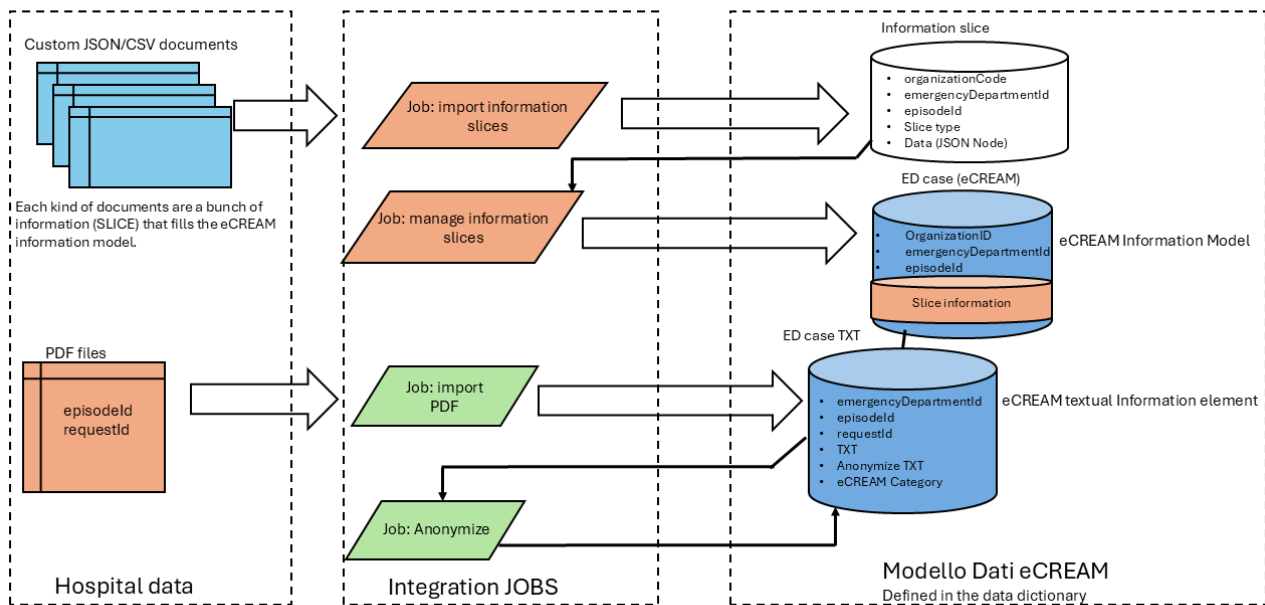
preprocessing procedures, allowing data to be sent to the NLP training platform (where applicable) in compressed zip format or to the central eCREAM server.

The T2.5 document presents an initial local workflow featuring a preprocessing pipeline to populate staging databases and manage data administration and control processes.

In recent months, the eCREAM Hospital Client component has been developed to collect and process data extracted from medical records. Detailed information on this application module is available in the 'Development of eCREAM Hospital Client' section.



The following image illustrates how data extracted in PDF and JSON formats from hospital records are processed by specific jobs, enriching the eCREAM data model with structured clinical, logistical and textual data.



### Web Manager Console

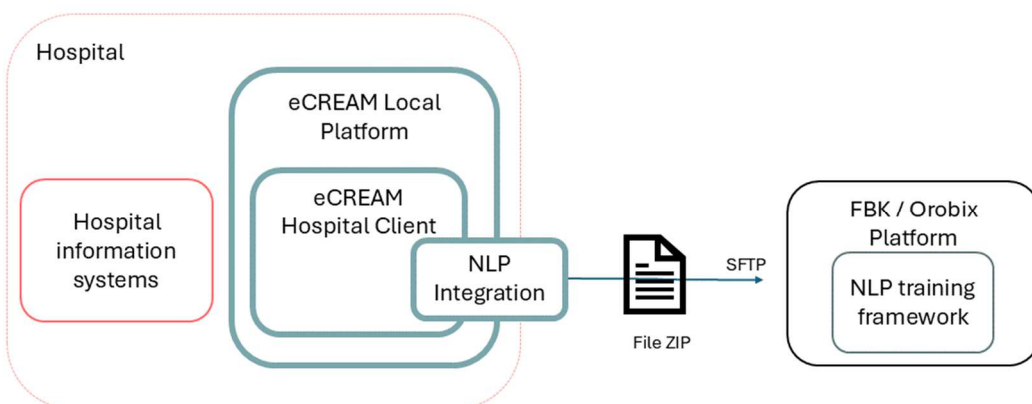
The Web Manager Console is a web interface designed for Astir's technical operators, authorised by individual hospitals, to efficiently and intuitively manage the console's main functionalities.

This interface facilitates efficient and accurate interaction with hospital data and management of information retrieval operations.

The Web Manager console is part of the eCREAM Hospital Client and can be accessed via VPN, allowing work to be conducted within the hospital on the eCREAM Local platform.

### NLP Integration

For NLP Training (NLP-DeVal), the local eCREAM component prepares the files in compressed format for transfer to the NLP platform on the Orobix and FBK servers.



The eCREAM Hospital Client component processes textual notes and data extracted from reports in PDF format from the Emergency Room, LIS, RIS and other vertical folders.

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This component anonymizes the data, removing any links that could trace it back to the specific emergency department event from which it originated.

All information relating to the patient (e.g., name, surname, date of birth, address, telephone number, etc.) and to the context (e.g., hospital, date and time of arrival, date and time of visit, admission decision, date and time of discharge/re-hospitalisation, etc.) is removed.

Notes related to the patient's health status (e.g., medical history, clinical examination, test results) are separated to prevent the reconstruction of the patient's entire profile.

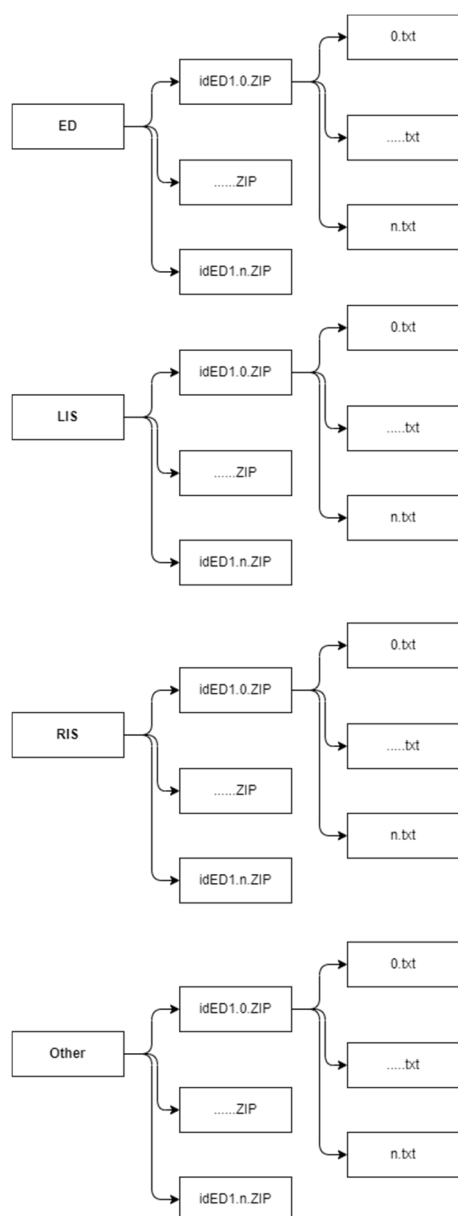
Any reference to third parties noted by healthcare staff during attendance in the ED will also be removed from these notes. Further details can be found in the 'Development of the eCREAM Hospital Client - NLP Integration' section.

The preparation of the files to be sent is managed by the **NLP Integration module**, which includes a specific job that generates ZIP files for the different categories.

These files will be transferred via SFTP to an FTP server in the NLP training platform. Access to the server will be protected by username and password, and additional security will be provided by configuring firewall rules on the receiving platform to accept transfers only from the sending hospital's fixed address.

To prevent overwriting files, the destination FTP folder must include a subfolder named after the hospital collecting the files.

Below is a folder structure diagram at both the source and destination FTP server.



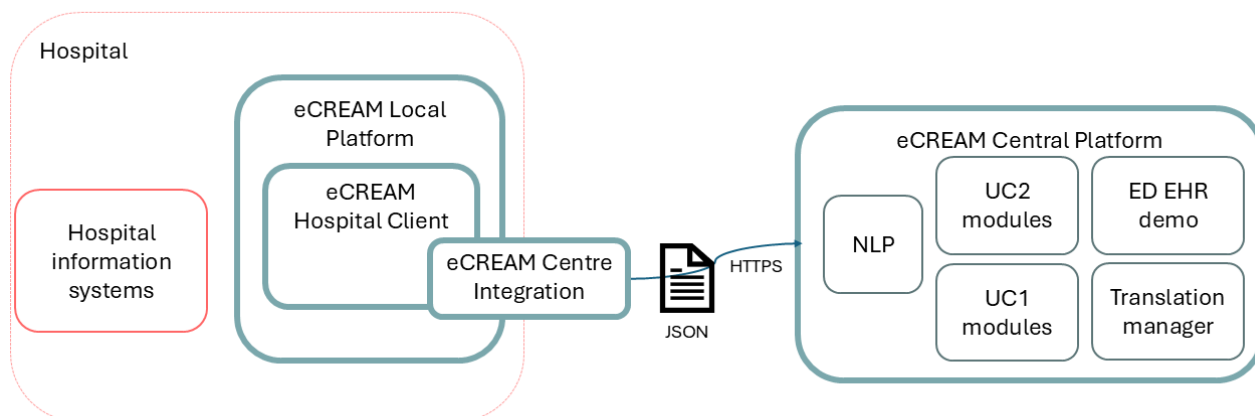
### *eCREAM Centre Integration*

Data transfer to the central eCREAM platform for UC1 and UC2 cases is managed by the eCREAM Centre Integration component. This component imports files extracted from medical records into the eCREAM model, aggregating structured and textual data into coherent episodes. Detailed information about this process is available in the 'Development of the eCREAM Hospital Client' section.

Another component is responsible for anonymizing textual data and integrating it into the JSON structure of the individual episode files before sending them to the central eCREAM platform.

The **eCREAM Centre integration** component is also responsible for sending the data collected in eCREAM Local to the central platform and for interacting with the NLP component to receive the cases of patients with dyspnoea or TLoC, as well as the structured information needed to complete the episode data in CFR.

The file transfer will occur over HTTPS.



### Other external interfaces

Interfaces between Central eCREAM and the new ED-EHR are being analysed. These will utilise HL7 FHIR APIs, as the ED-EHR system exposes FHIR resources. Data collection will be based on UC1 and UC2 requirements.

The communication interface and data transfer from Central eCREAM to the MIP platform are also being reviewed. Data will be extracted from Central eCREAM's database instances in a format compatible with the MIP. The specifics of this data transfer are still being determined.

The software production environment for the eCREAM interface modules is being installed.

## 3.2 The Local eCREAM Platform

### 3.2.1 Software production environment

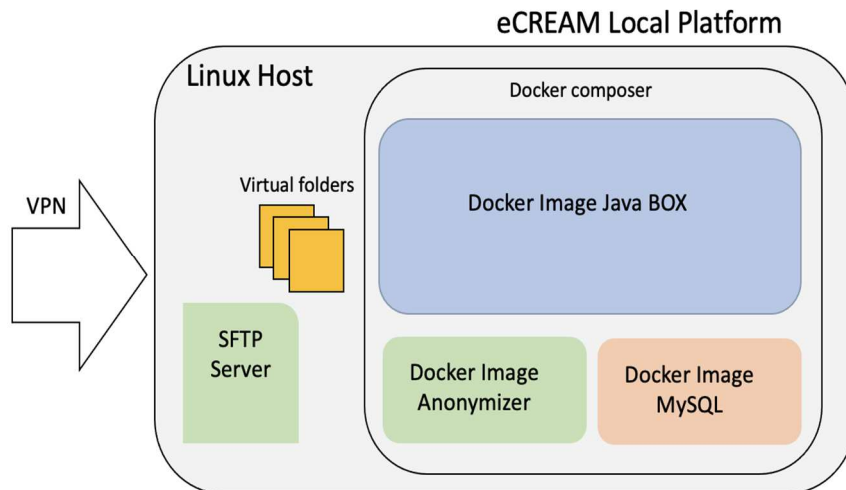
The software production environment for the components of the Local eCREAM system will be installed at each participating hospital's site.

The installation requires a dedicated or virtual Linux machine with the following minimal sizing parameters:

- CPU: 8 core
- RAM: 32 GB
- Local Disk: 50 GB used for Operating System and software tools.
- Data Disk: 250 GB dedicated to patients' data extracted from the Hospital environment and to custom software modules that make up Local eCREAM.

The main components that constitute the software prerequisites for the proper working of the Local eCREAM modules are:

- Demone Docker
- Server FTP
- VPN Access



Nominal VPN access is mandatory to perform installation and maintenance activities.

Docker Compose is used to orchestrate and manage a multi-service environment. Docker Compose is used to define and manage all containers as a single application, allowing containers to be started, stopped, and managed in a coordinated manner.

Each service runs in its own Docker container, but Docker Compose coordinates them through a configuration file. Docker containers communicate using a local network and share files via volumes connected to individual containers.

To enable communication with remote eCREAM components, it is necessary to open the following firewall routes:

- **SFTP:** for sending NLP data (where applicable, not all hospitals are involved in NLP Training activity)
- **HTTPS:** for integration with eCREAM server components (UC1 and UC2) and for use of the manager console exposed by eCREAM Local.

All installation activities are carried out by Astir personnel. An installation document was created to simplify and automate the installation of the environment across all hospitals involved in the eCREAM project. This document outlines all the steps required to set up the eCREAM Local software production environment properly.

Docker images may vary depending on the specific needs of individual hospitals. The following are the standard images proposed for all Local eCREAM installations:

- **Anonymizer:** Image dedicated to text analysis to identify, classify, and mask text portions containing personally identifiable information. It performs a text anonymization function.
- **MySQL:** Image dedicated to providing the MySQL server used to store the information processed by the individual components.
- **Java:** Image dedicated to providing all custom software components used to implement all the functionalities exposed by the Local eCREAM system.

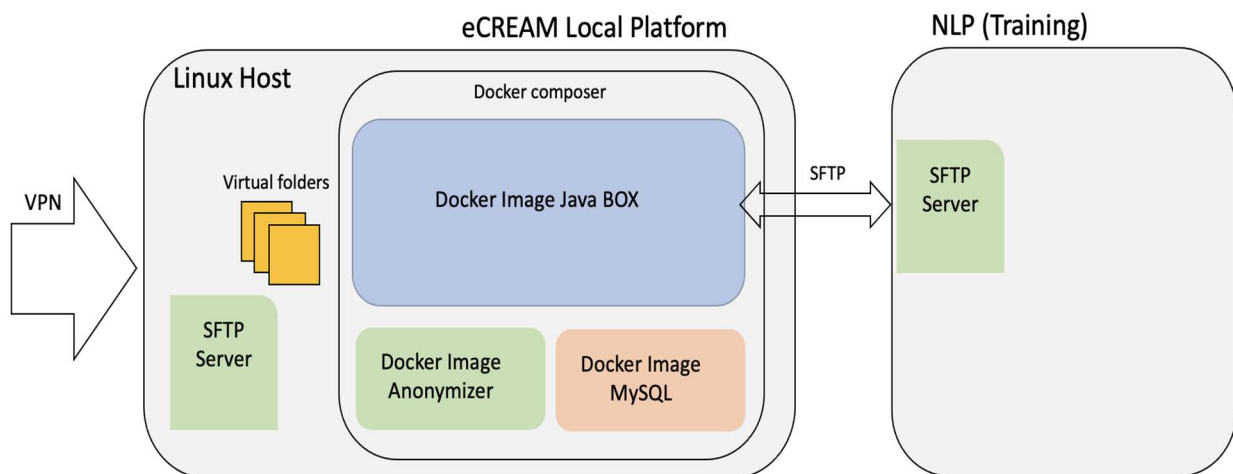
Some choice rationales made in defining the solution:

- Use of **Docker containers:** ensures maximum portability of software packages by limiting software dependencies on the HOST machine to the presence of the Docker daemon

- Use of **shared volumes** between the Docker instances and the HOST machine: to simplify the file sharing procedure between the different components of the system and to simplify the adaptive and corrective maintenance procedure on the custom components that make up the application modules (see the section on component development).

### *Integration of Local eCREAM with NLP (Training)*

The software component responsible for integrating the eCREAM Local system with the NLP training component uses the same deployment environment as the eCREAM Local system. This integration is essential for the NLP model training process. It provides the eCREAM Local system as the data source, while the NLP system serves as the recipient for the training procedure.

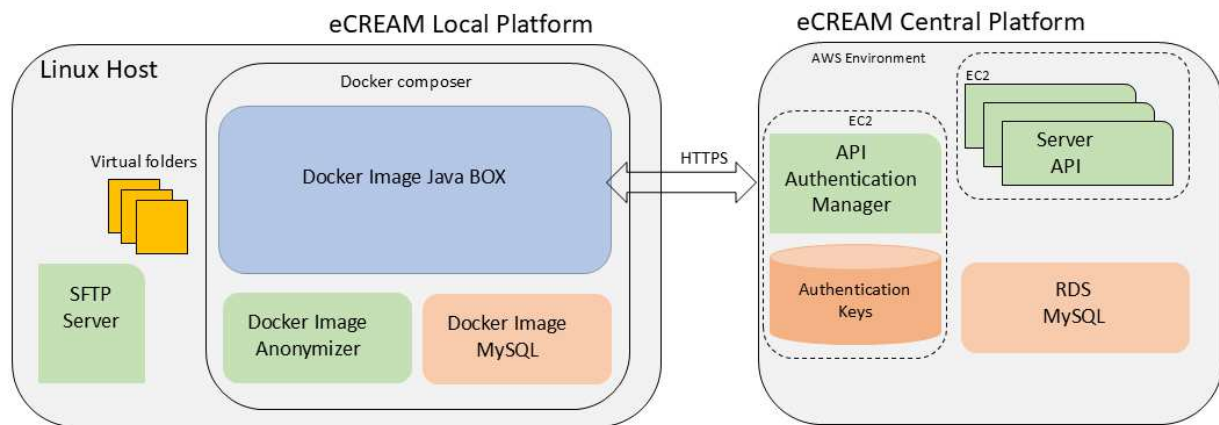


The installation of an SFTP server is planned on the NLP side. This server will be used by the custom components present on the eCREAM Local system to send “envelopes” (ZIP files) containing a set of anonymized documents that the NLP system can use.

### *Integration of eCREAM Local with eCREAM Central*

The software component responsible for integrating the eCREAM Local system with Central eCREAM operates within the same deployment environment used for the eCREAM Local system. Communication between the Local eCREAM component (acting as the source) and Central eCREAM (the destination) is managed via Rest APIs.

This communication is secured using the HMAC protocol, which ensures both the integrity of the messages and the authenticity of the source.



The integration components on the eCREAM Central platform are hosted in the AWS environment (Europe zone). Authentication is managed through a single access point provided by an EC2 instance (virtual machine).

The EC2 virtual environment will also host the components that implement the APIs for UC1 and UC2.

The use of the AWS RDS component was chosen to implement the MySQL server responsible for managing application data. The solution supports both horizontal and vertical scaling, thanks to the scaling capabilities offered by the AWS environment.

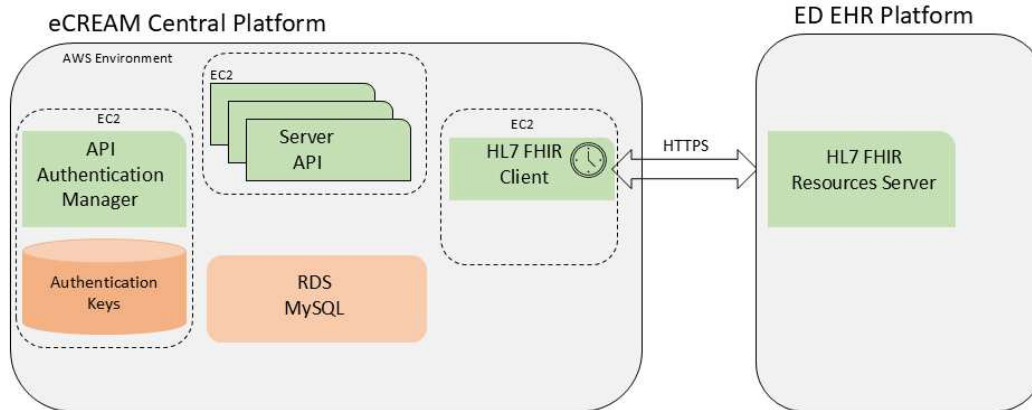
### *Other interfaces to Central eCREAM*

Based on the current state of progress of the design and development of the components involved, detailed information about the software production environment dedicated to interfacing with the eCREAM Central system is not yet available.

During the project, an AWS environment was established to support the implementation of the eCREAM Central platform. The cloud-based delivery approach provides the flexibility to allocate the required resources as soon as the specification and design phases are completed, which aligns with the project's schedule.

### *Integration of ED-EHR with eCREAM Central*

In the current scenario, the integration protocol for managing data needed for UC1 and UC2 has been established as HL7 FHIR. The ED-EHR system will provide the necessary FHIR resources to cover the information requirements for these operational scenarios.



On the eCREAM Central side, an EC2 instance will be dedicated to scheduling, retrieving, and processing the FHIR resources defined during the detailed analysis. The data received will be saved in the RDS database and used to manage the data retrieved from the eCREAM Local.

Further details will be provided as the platform architecture design progresses according to the Gantt timeline.

### 3.3 The eCREAM Hospital Client

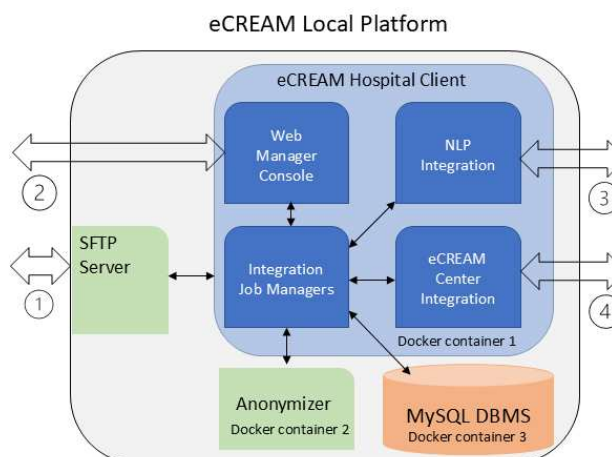
#### 3.3.1 Development

The eCREAM Hospital Client component, developed by Astir, is designed to retrieve, read, and analyse information from documents (in PDF and JSON formats) exported from the ED-EHR and other hospital tools. The information is then normalised, anonymized, and sent to the central platform to support the eCREAM scenarios UC1 and UC2.

Given the complexity of the existing application landscape in eCREAM project facilities, Astir focused on creating a flexible and configurable data acquisition pipeline.

The system runs on the Docker infrastructure, and three Docker containers make up the application:

1. **Java container:** Container used to run the Java-based services used to implement all the application logic necessary to execute the data acquisition and transformation pipeline for hospital data
2. **DBMS container:** Container used to deliver MySQL database server
3. **Anonymizer container:** Container used to run the anonymization service.



The system has **four external** communication interfaces:

- **FTPS channel:** acquires all documentation from hospital systems (point one),
- **Web Interface:** manages all acquisition operations (point two),
- **NLP Model Training Interface:** dedicated to hospitals supporting NLP model training activities (point three),
- **Data Communication Interface:** sends the data necessary for UC1 and UC2 (point four).

The applications relating to containers two and three are market products and will not be analysed in detail in this paragraph:

- MySQL server
- Maize Anonymizer

The eCREAM Hospital client component hosted within container one consists of a JAVA application made up of four main modules:

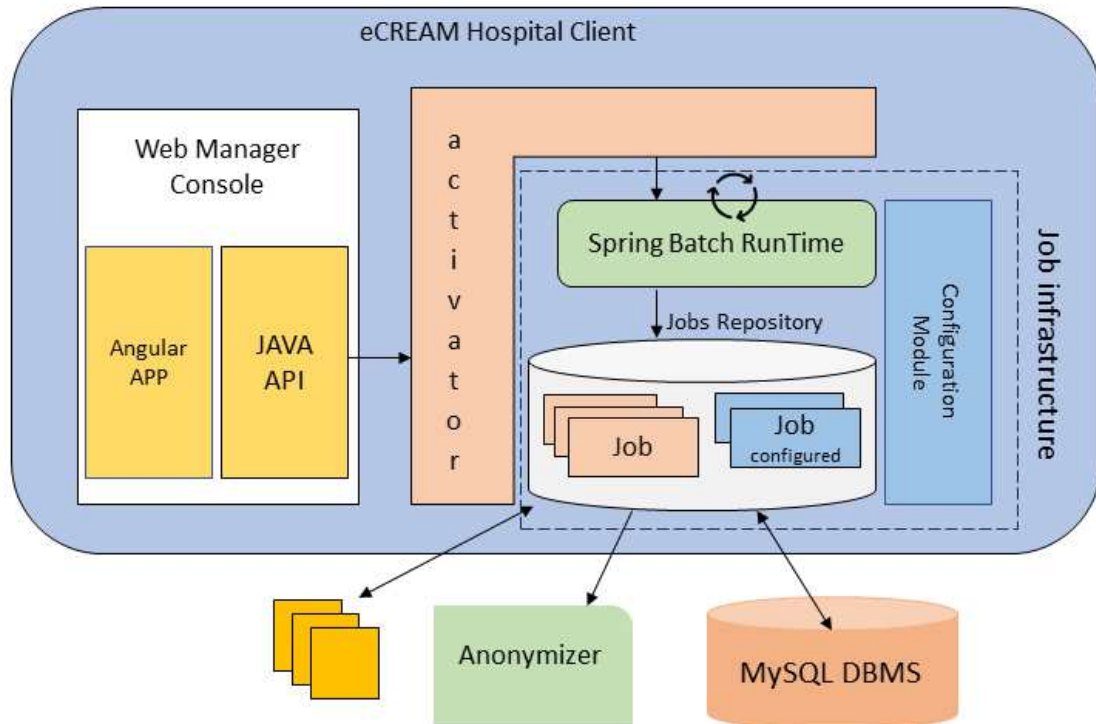
- **Integration Job Managers: Spring Batch**-based component used to manage all data analysis/retrieval jobs
- **Web Manager Console:** WEB component based on Spring MVC is used to activate data analysis/retrieval jobs and to analyse data imported from hospital repositories
- **NLP Integration:** component used to send the “envelopes” (ZIP documents) used to NLP model training procedure
- **eCREAM Centre Integration:** component dedicated to integration with the eCREAM Central service.

The following paragraph describes in detail the design of the application components, the supporting data model, the main Spring Batch ‘Jobs’ developed, and, finally, the main functions of the web management console.

### *Design of the solution*

The following image describes the main modules that make up the eCREAM Hospital Client component:

- **Application Design:** Utilises a plug-in ‘Job’ architecture built on the Spring Batch runtime
- **Custom Import Pipeline:** A tailored Import Pipeline is created using a subset of Jobs from the Job Repository for each hospital. This customization addresses the specific characteristics of the hospital systems involved.



The application design includes two main functional areas:

- The “**Web Management Console**”
- The “**Job Infrastructure**” is built on the Spring Batch framework.

The “**Activator**” layer acts as the glue between the two areas and makes an integration interface available between them.

The “**Web Management Console**” consists of a Java backend module based on Spring Boot (**JAVA API**), which exposes a set of APIs used by the Angular-based application component (**Angular APP**), which implements all the UI features made available by the system to the end user.

The Activator layer exposes a set of APIs used by the Java API module dedicated to interaction with the Job-based ecosystem; the main ones are:

- Retrieve all the Jobs configured in the system
- Displays the status of all available Job runs in the system
- Activate and stop a Job
- Monitor Job runtime parameters.

The Job-based subsystem is made up of three main elements:

- **Spring Batch runtime:** It provides the basic functionalities for executing and monitoring individual Jobs
- **Job Repository:** It is a persistence layer used to manage data for configuration job parameters and runtime job parameters
- **Configuration module:** It lists the jobs used to implement the hospital data ingestion pipeline within a single installation.

The system is installed within the hospital facilities without any configured Job. The list of Jobs required to make eCREAM UC1 and UC2 possible has been defined after a joint analysis activity with hospital information systems. Each eCREAM Hospital Client installation includes its own list of integration jobs.

One of the system's most important elements is the integration jobs developed within the eCREAM project dedicated to data analysis, extraction, normalisation, and anonymization. All other system components are designed to handle these custom integration jobs easily.

The eCREAM Hospital Client system is equipped with a series of Jobs called 'standard' and can be used in all hospital facilities. If new integration functionality is needed for the individual hospital, a new Job can be created, saved in the Job repository, and made available to other system components to compose the new integration data pipeline.

Below are the "standard" jobs integrated into the eCREAM Hospital Client:

- **PDF integration Job:** it manages incoming PDF hospital documents for different document **categories**
- **Fragment integration Job:** it manages the acquisition of information from different hospital systems. Each different source will be handled by its own "Fragment Job" named in relation to the **source** involved (more details later)
- **Anonymizer Job:** manages the anonymization task of all documents. All documents must be anonymized before being used within eCREAM use cases. It uses the features exposed by the **Anonymizer service** installed (See Docker container three)
- **ZIP maker Job:** Generate ZIP files for different document categories. It is used for NLP training tasks.

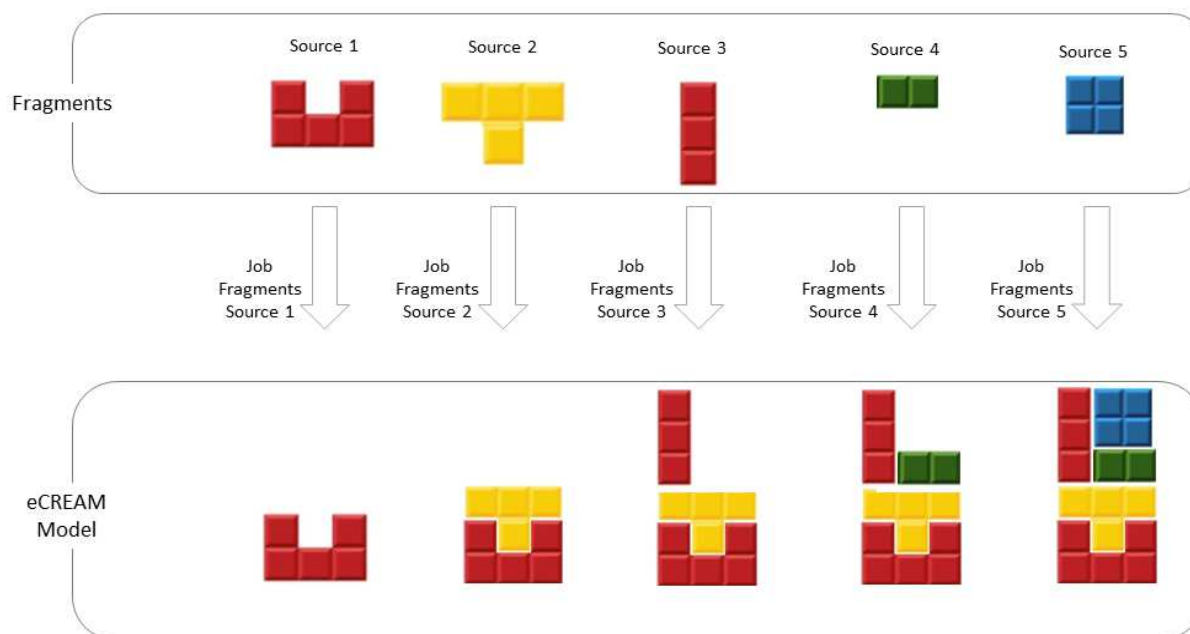
Other 'standard' works will be developed in relation to the functional evolution of the CREAM project.

### *Fragment integration Job*

The information that constitutes a single episode of access to the emergency room could be composed of data of different natures (clinical, logistical, documentary) and could come from different sources (emergency room records, laboratory analyses and radiological systems).

The eCREAM Hospital Client component is designed to manage information flows sent from different sources in different combinations based on the hospital configuration.

The main idea that guided the design of the 'Fragment Job' is to be able to divide the entire information set of the eCREAM model into information subsets in relation to the hospital extraction sources identified (or with regard to the time perimeter relating to the extraction). The individual Jobs connected to the single "Source" process the information fragment and contribute to the composition of the final data model for each ED access.



The breakdown into “Fragments” can be customised for each hospital installation. In the basic version of the eCREAM Hospital Client system, it was decided to classify the information data into categories, generating for each one its own acquisition ‘Fragment Job’:

- Logistical
- Clinical
- Documentary

**Logistical data:** administrative information (hospital code, episode identifier, triage code, etc.) and information that defines the timing of the emergency room process (date and time of patient arrival, date and time of triage, date and time of monitoring, date and time of the discharge decision, date, and time of the request for examination/visit, etc.).

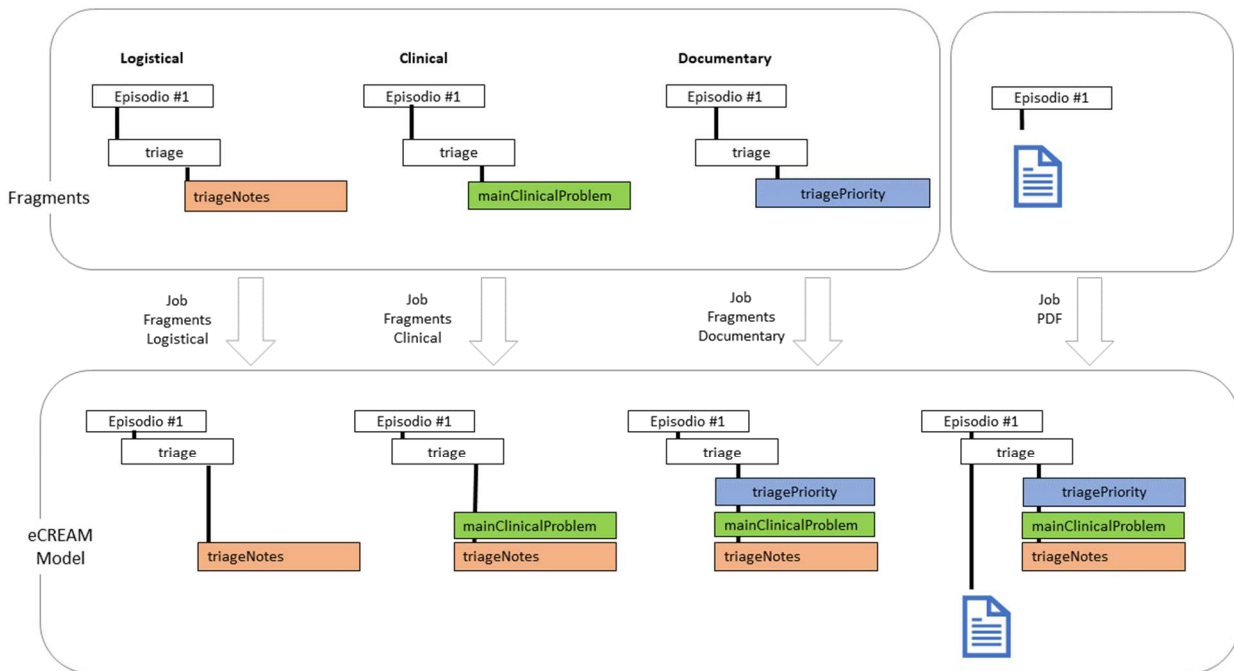
**Clinical data:** information more closely related to the patient’s state of health, including the detection of vital parameters, laboratory results and visits, therapy, etc.

**Documentary data:** data recovered from the textual notes present in the triage notes, anamnesis, home therapy, medical examination, specialist visit, clinical diary, etc. This information will be used in the training task to create the NLP model.

### *PDF integration Job*

This Job analyses PDF files (examination and test reports) linked to an ED episode and extracted from hospital systems. The content of the PDF file is extracted in text format and associated with the individual case, adding information from examinations performed outside the ED to the health record.

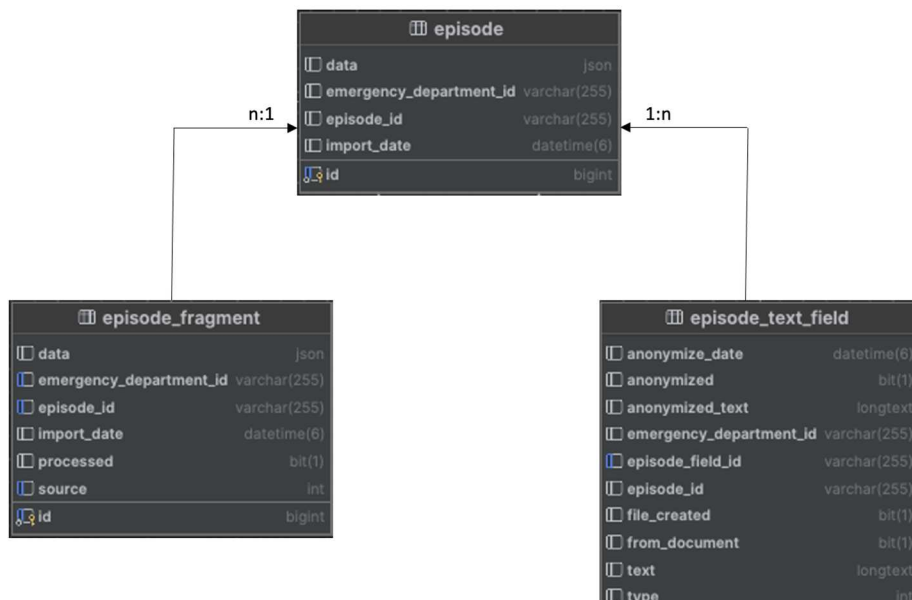
The image below shows a composition flow that considers three different sources (documental, clinical, and logistical) and a PDF flow. Information extracted from different systems at different times adds up to complete the eCREAM data model.



All attributes associated with the eCREAM model have been classified in relation to the three classes (see “Annex 2\_D2.2- eCREAM Classification of attributes” for details).

## Data model

The set of integration jobs described previously transforms the information retrieved from hospital systems into the persistence model shown in the following diagram. The diagram depicts only the main entities; all the persistence tables used by the Spring batch runtime engine are not shown.



A brief description of the entities follows:

- **Episode:** represents the single emergency room episode. The information content is stored as a JSON field in the data attribute. The episode ID and emergency room ID identify it

- **Episode\_fragment:** contains all the information extracted from the single fragment. It is characterised by the source used (source field). The case identifier and the emergency room identifier identify it
- **Episode\_text\_field:** contains all the document attributes relating to a single textual element. It is characterised by a typology (documentary category). It contains the text of the document and a set of flags used by NLP anonymization and extraction jobs. It is connected to the emergency room case through episode Id.

### Web Manager Console

The Web Management Console is a web application that exposes a series of operational functions such as job activation, job execution monitoring, and analysis of the results of the acquisition procedures.

The user interface was designed with top-level navigation located at the top of the screen. Navigation includes two operational areas:

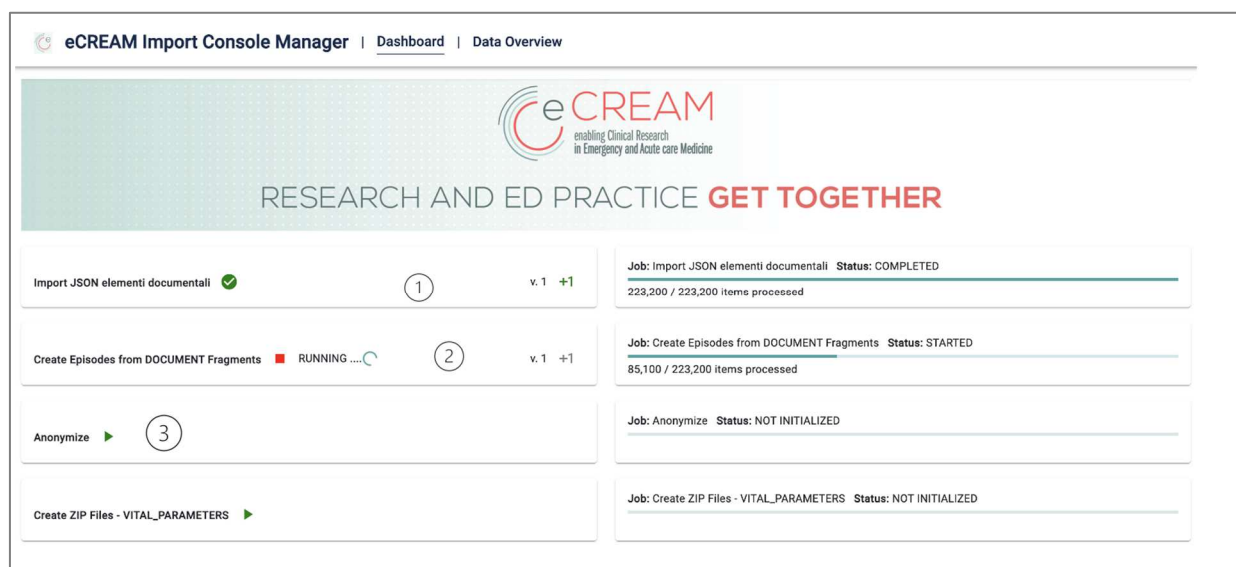
- Dashboard
- Data Overview



### Dashboard

The monitoring dashboard provides a complete view of the configured import jobs, allowing one to constantly monitor the outcome of the processes.

The following image shows the interface of the dashboard application area where all configured import jobs are listed. The example shows four configured jobs.



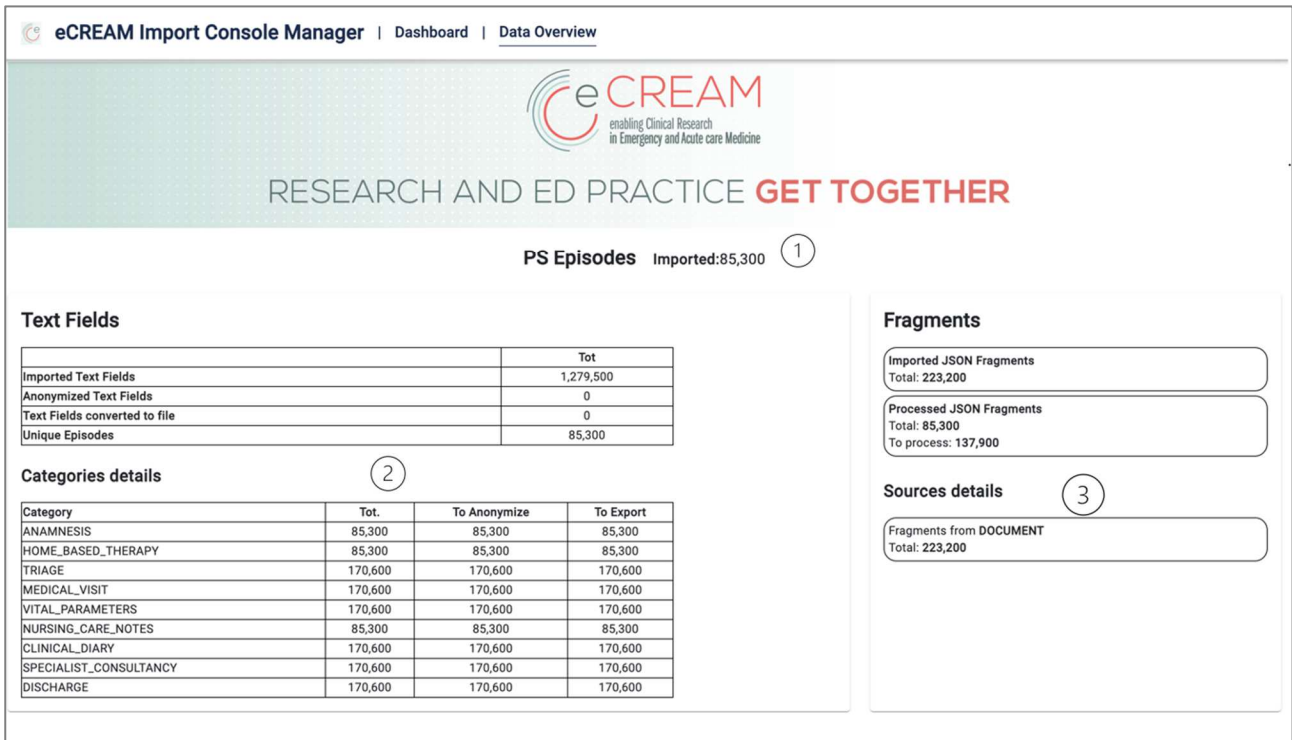
In detail, the following application scenarios present in all Jobs can be observed:

## TESTING OF eCREAM INTERFACE MODULES

1. **Job executed correctly:** in this state, the processed elements and the final state of the Job can be viewed. Using the +1 button, it is possible to activate and run a new version of the Job.
2. **Job running:** in this state, it is possible to view the progress of the Job and, if necessary, interrupt the execution of the Job itself.
3. **Job not yet executed:** in this case, it is possible to activate and run the Job.

### Data Overview

Through this application area, it is possible to view the counts of all the entities saved within the data model of the eCREAM Hospital client system.



**PS Episodes** Imported: 85,300 ①

**Text Fields**

	Tot
Imported Text Fields	1,279,500
Anonymized Text Fields	0
Text Fields converted to file	0
Unique Episodes	85,300

**Categories details** ②

Category	Tot.	To Anonymize	To Export
ANAMNESIS	85,300	85,300	85,300
HOME_BASED_THERAPY	85,300	85,300	85,300
TRIAGE	170,600	170,600	170,600
MEDICAL_VISIT	170,600	170,600	170,600
VITAL_PARAMETERS	170,600	170,600	170,600
NURSING_CARE_NOTES	85,300	85,300	85,300
CLINICAL_DIARY	170,600	170,600	170,600
SPECIALIST_CONSULTANCY	170,600	170,600	170,600
DISCHARGE	170,600	170,600	170,600

**Fragments**

Imported JSON Fragments  
Total: 223,200

Processed JSON Fragments  
Total: 85,300  
To process: 137,900

**Sources details** ③

Fragments from DOCUMENT  
Total: 223,200

In detail, the following information sub-areas are present:

1. **ED Episodes:** total number of ED episodes present in the system
2. **Text Fields:** The area contains all the information relating to the analysis of the documentary components. The values are divided into two tables
  - a. The first table shows a summary of the textual elements and their status
    - i. **Imported Text Fields:** number of textual elements imported into the system
    - ii. **Anonymized Text Fields:** Number of anonymized textual elements
    - iii. **Text Fields converted to file:** Number of textual elements exported for the NLP model training procedure
    - iv. **Unique episodes:** the number of unique episodes that have at least one associated textual element
  - b. The second table – Categories details – shows a series of summary data for each document category, such as:
    - i. **Tot.:** the total number of elements related to the category
    - ii. **To Anonymize:** the total number of items that need to be anonymized
    - iii. **To Export:** the total number of items that need to be exported

3. **Fragments:** combines and summarises the information deriving from the jobs that operated on JSON files from different sources, reporting the number of fragments imported and processed.

### 3.3.2 Installation

This paragraph describes the operational steps needed to install the eCREAM Hospital Client software component. The use of a Linux machine is assumed.

The installation of the eCREAM Hospital Client module involves the following phases:

- Basic software installation: Docker Daemon, SFTP Server
- Docker image installation: compressed file containing images of Docker instances
- Installation of eCREAM Hospital client software
- 'Integration Jobs' configuration for a single hospital.

#### *Basic software installation*

The following tools must be installed on the server that deploys the eCREAM Hospital Client component:

- Daemon Docker
- Server SFTP
- ZIP

As regards the installation of the Docker daemon and the SFTP server, the standard procedure for installing the Linux software package can be followed, and there are no custom procedures to follow.

**NOTE:** configure the “Docker Root Dir” folder to use the largest disk partition.

If not present, install the ZIP package on the deployment server machine.

#### *Docker image installation*

It is assumed that the following folder structure is present on the distribution server



```
• eCREAM
  ◦ images
    ▪ hospitalclient.tar.gz
    ◦ versione_<NumeroVersione>.zip
```

where the “**hospitalclient.tar.gz**” file contains the Docker images that need to be installed on the HOST machine.

To install the images, run the:

```
docker load -i hospitalclient.tar.gz
```

Check the presence of the images through the

```
docker images --all
```

The three new Docker images are present:

- mysql:8.3.0
- hospitalclient:latest
- europe-west4-docker.pkg.dev/maize-devops-platform/anonymai/ecream:202403251228

### *Installation of eCREAM Hospital client software*

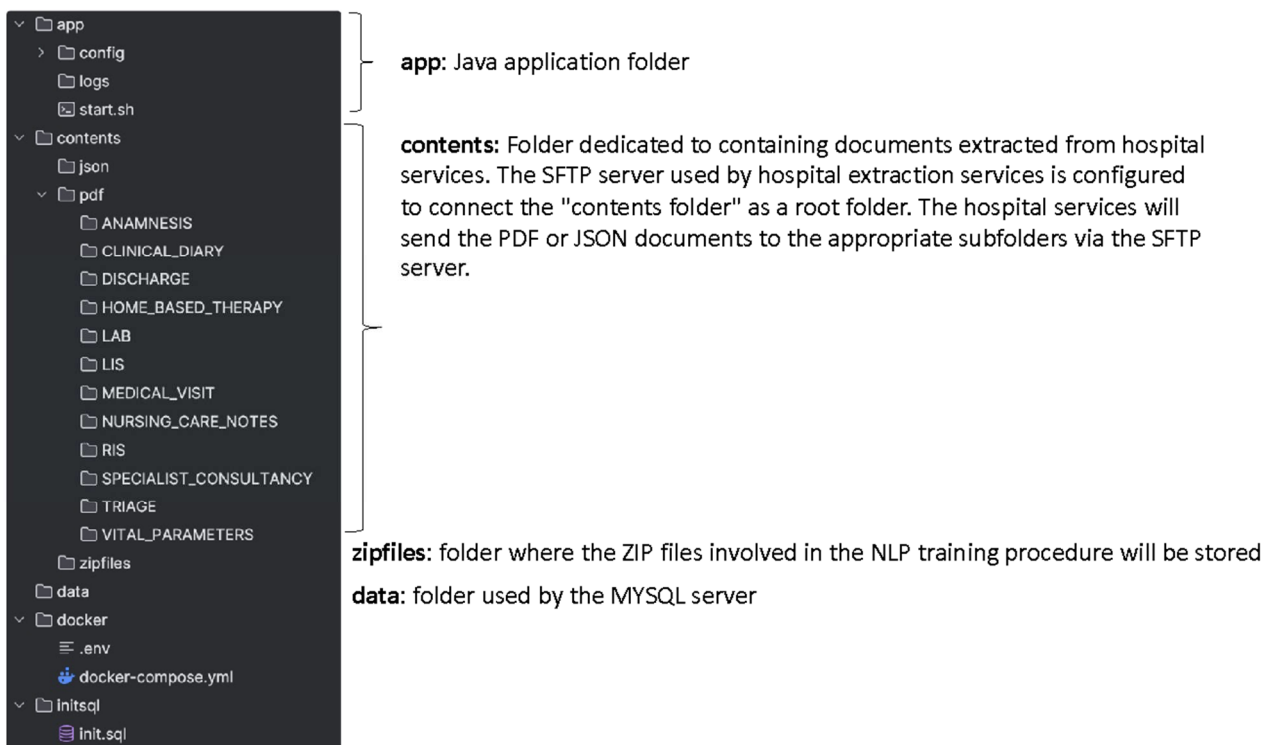
The software package is released as a ZIP file; see the initial folder structure image above.

Run the following commands (assuming a Linux environment)

```
1 unzip versione_<NumeroVersione>.zip
2 cd ./app
3 chmod +x start.sh
4 cd ../docker
5 docker compose up -d
6
7 docker container ls -a
```

At the end of the procedure, the three Docker containers described in the previous paragraphs must be present.

The structure of the folders relating to the component is shown below.

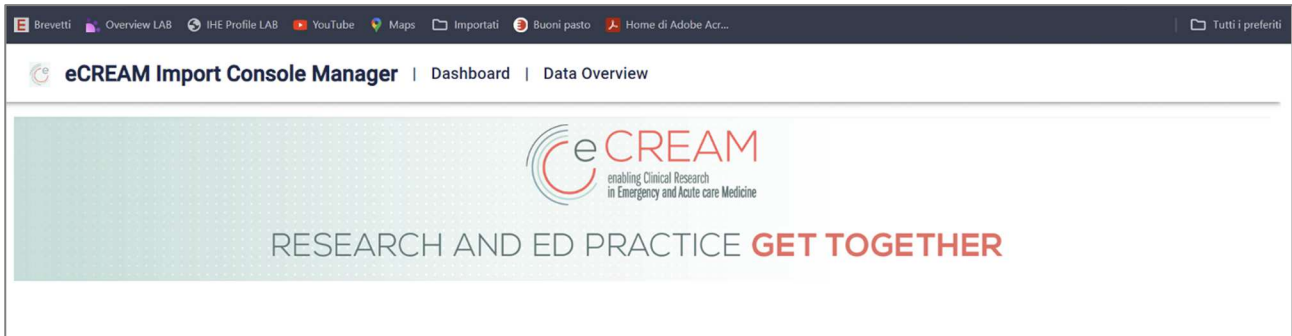


### *'Integration Jobs' configuration for single hospital*

The first installation steps are common to all hospitals involved in the eCREAM project. The current section is custom for each hospital. The Astir team will create the appropriate configuration SQL queries to be executed on the MySQL DBMS based on the data acquisition pipeline designed with the hospital services.

The first installation of the component took place in the third week of June at the San Giovanni Bosco Hospital of the ASL City of Turin. Installation was carried out on a hospital server whose requirements were shared with the hospital. The local installation is reachable via VPN and only for authorised Astir personnel.

VPN access allows the eCREAM Hospital Client interface to be reachable. Below are the images of the Web Console Manager installation.



The necessary documentation for appointing Astir as External Data Processor for the protocols approved by the Ethics Committee of the ASL Città di Torino is being defined and signed.

Only after this formal step will it be possible to proceed with extracting information from hospital records and feed the eCREAM model with the data of the first hospital to join the project.

As mentioned in T2.6, during this period, Astir contacted suppliers from other hospitals involved in the project to share interface specifications and assess any changes needed so that upcoming installations and data exports could be planned as soon as possible.

### 3.3.3 Testing

Three different testing strategies were applied to the eCREAM Hospital Client component:

- **Unit testing** on individual JOBS in the test environment
- **Integration testing** with **simulation data** in a test environment
- **Integration tests** on **test cases** in a Turin hospital production environment.

A software production environment dedicated to test functions in the AWS environment was created to carry out the first two types of tests.

#### *Unit testing on individual JOBS*

Every single JOB has been individually tested to verify functionality. A test case was created for each import JOB to verify correct functioning.

The following table is an example of the **test case** for the PDF JOB:

Action	Data	Expected Result
Database Clean up	Run the query: - drop schema ecream;  Stop and start application: - docker compose down - docker compose up -d	Up and running application with empty initial configuration
Configure the PDF JOB by executing the insert query	INSERT INTO ecream.job_configuration (job_title, instance_name, job_name, job_url, job_parameters) VALUES ('Import PDF - TRIAGE', 'importPdfTextFieldJob-TRIAGE', 'importPdfTextFieldJob',	Check the presence of the JOB: 'Import PDF - TRIAGE' via the management console in the dashboard area

	<code>‘/pdf/start_job.html’, {“CATEGORY”: “TRIAGE”}’};</code>	
Save a new PDF file in the folder: contents/pdf/TRIAGE	<p>The name of the PDF file must follow the following naming convention: d_ps&gt;_&lt;id_episodio&gt;_&lt;request_id&gt;.pdf</p> <p>Where:</p> <ul style="list-style-type: none"> <li>• id_ps: emergency room identifier</li> <li>• id_episodio: identifier of the single episode</li> <li>• request_id: request identifier</li> </ul>	
Run the task: ‘Import PDF - TRIAGE’ via the management console		<p>Check the success of the execution on the management console.</p> <p>Check for the presence of the new record in the Episode_text_field table with the ids extracted from the PDF file name.</p> <p>Compare the contents of the PDF file with the “text” field of the table.</p>

### Integration testing

To verify the functioning of an entire integration pipeline in a test environment, the following configuration was created:



- Fragment JOB ‘Documentary’ source
- Anonymizer JOB
- ZIP JOB for vital parameters category.

To verify the execution of the pipeline on a significant number of cases, the ‘random’ creation of cases over three years was hypothesised: 2021, 2022, 2023.

For each year, a folder was created per month, numbered from one to twelve.

To simulate a high-capacity emergency room it was decided to generate 6,200 cases per month for a total of 223,200 cases. To each case, 15 textual elements were added for a total of 3,348,000 textual elements.


The integration pipeline was applied to the generated data, verifying the processing times and the correctness of the results.

## TESTING OF eCREAM INTERFACE MODULES

The image shows the counts at the end of the 'Fragment JOB' while the anonymization JOB is running.

The fragments were processed successfully (the fragments to be processed are zero). The number of cases and textual elements is as expected.

Loading data...


**eCREAM**  
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# RESEARCH AND ED PRACTICE GET TOGETHER

PS Episodes Imported:223,200

## Text Fields

	Tot
Imported Text Fields	3,348,000
Anonymized Text Fields	14,000
Text Fields converted to file	0
Unique Episodes	223,200

## Categories details

Category	Tot	To Anonymize	To Export
ANAMNESIS	223,200	223,200	223,200
HOME_BASED_THERAPY	223,200	223,200	223,200
TRIAGE	446,400	446,400	446,400
MEDICAL_VISIT	446,400	446,400	446,400
VITAL_PARAMETERS	446,400	446,400	446,400
NURSING_CARE_NOTES	223,200	223,200	223,200
CLINICAL_DIARY	446,400	446,400	446,400
SPECIALIST_CONSULTANCY	446,400	446,400	446,400
DISCHARGE	446,400	446,400	446,400

## Fragments

Imported JSON Fragments  
Total: 223,200

Processed JSON Fragments  
Total: 223,200  
To process: 0

## Source details

Fragments from DOCUMENT  
Total: 223,200

The execution times recorded are as follows:

JOB	Timing
Fragment Job	200 cases (average) per minute – completed in 19 hours
Anonymizer Job	380 cases (average) per minute – completed in 6 days

on the pipeline, the Management Console shows the complete processing of the document category: VITAL\_PARAMETERS.

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RESEARCH AND ED PRACTICE GET TOGETHER

PS Episodes Imported:223,200

Text Fields

	Tot
Imported Text Fields	3,348,000
Anonymized Text Fields	3,348,000
Text Fields converted to file	446,400
Unique Episodes	223,200

Categories details

Category	Tot.	To Anonymize	To Export
ANAMNESIS	223,200	0	223,200
HOME_BASED_THERAPY	223,200	0	223,200
TRIAGE	446,400	0	446,400
MEDICAL_VISIT	446,400	0	446,400
VITAL_PARAMETERS	446,400	0	0
NURSING_CARE_NOTES	223,200	0	223,200
CLINICAL_DIARY	446,400	0	446,400
SPECIALIST_CONSULTANCY	446,400	0	446,400
DISCHARGE	446,400	0	446,400

Fragments

Imported JSON Fragments  
Total: 223,200

Processed JSON Fragments  
Total: 223,200  
To process: 0

Sources details

Fragments from DOCUMENT  
Total: 223,200

### Integration tests on real cases

The first test data extraction was done with the ASL City of Turin suppliers after sharing the specifications (see "Annex 3\_D2.2 - eCREAM Application Interface Specifications UC1 e UC2"). For purely explanatory purposes, a JSON path received completely from a single source, i.e., the ED EHR, is attached.

```
{
  "nursingCareStart": "2023-08-01T09:14:23",
  "episode": {
    "organizationCode": "010011",
    "emergencyDepartmentId": "345",
    "episodeId": "2023-40045",
```

```

"edArrivalDateTime": "2023-08-01T09:14:23",
"sex": "1",
"age": "81",
"arrivalModeCode": "3",
},
"triage": {
"triageDateTime": "2023-08-01T09:14:23",
"triagePriority": "4",
"triageNotes": "In PS per otite esterna, gcs 15, loc. autonomo.",
"mainClinicalProblem": "23",
"secondaryClinicalProblem": "Vie aeree: LIBERE, Respiro: NORMALE, Circolo: NORMALE, Coscienza: VIGILE COSCIENTE"
},
"discharge": {
"dischargeDecisionDateTime": "2023-08-01T09:52:03",
"dischargeDateTime": "2023-08-01T09:52:03",
"modeOfExit": "1",
"diagnosisAtEDDischarge": "ALTRE OTITI ESTERNE ACUTE (OTITE ESTERNA ACUTA NAS)",
"dischargeNotes": "Rimozione tappo di cerume bilaterale. Otite esterna acuta destra. \nPr: Unixime 400 cpr: 1 cpr al di x 5 gg;\nPr: Cilodex gtt: 5 gtt in Au dx x 2 volte al di x 5 gg."
},
"vitalParametersList": [
{
"id": 2453277,
"dateTimeDetection": "2023-08-01T09:14:23",
"levelConsciousness": 15
}
],
"medicalVisitList": [
{
"id": 12901528,
"dateTimeMedicalVisit": "2023-08-01T09:41:47",
"medicalVisitOutcome": "allegato"
}
],
"anamnesis": "otalgia"
}

```

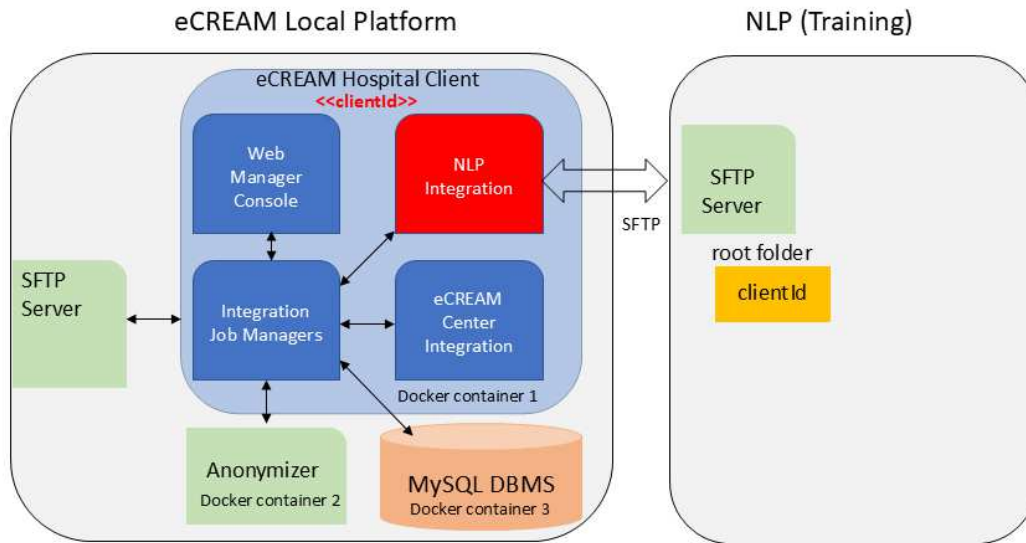
Through these tests, it was possible to identify some syntactic and JSON format problems shared with the supplier to correct and plan a new simulation.

A complete pipeline for the acquisition of JSON fragments, radiology PDF files, and laboratory PDF files was verified on the data provided with a positive outcome (excluding the corrections requested on the JSON format).

### 3.4 eCREAM Hospital Client – NLP Integration

#### 3.4.1 Development

“NLP Integration” is the “eCREAM Hospital client” system component that manages the integration flow and is dedicated to transferring the documents used by the training procedure for the NLP model.





All document elements are generated by the Document Integration JOBS in relation to data sent from hospital systems. The “Integration Job Managers” system generates a set of ZIP files for each document category defined within the eCREAM project.

A new application TAB has been added to the “Web console” to manage the integration flow of document content to be sent to the training system.

Through the functions exposed by the administration console, it is possible, per individual document class, to:

- Visualise the number of documents sent to the training system
- View the number of documents not yet sent to the training system
- Activate the sending of documents to the training system


**eCREAM Import Console Manager** | Dashboard | Data Overview | NLP Training | UC1 | UC2



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Start NLP training data ▶

**Categories details**

Category (ZIP)	Sent	To be Sent
RIS	1,500	0
ANAMNESIS	0	5,000
TRIAGE	0	16,300
MEDICAL_VISIT	3,500	1,500

ZIP file communication is done through the SFTP protocol. Each eCREAM Hospital Client installation will have a dedicated user on the SFTP server provided by the NLP Training environment.

Each SFTP user created on the server will be associated with a folder whose name will be generated using the value of the “clientId” attribute that identifies each installation of the “eCREAM Hospital Client” system (see authentication procedure with the eCREAM Central system).

The “NLP Integration” component activated by the commands exposed by the management console will send ZIP files divided by document category - each category will be associated with a folder with the category’s name - where the generated ZIP files will be saved.

The generated files will have a maximum size of 100MB and consist of anonymized text files.

### 3.4.2 Installation

The installation of NLP Integration occurs simultaneously with the installation of the eCREAM Hospital client, being a component of the system itself.

### 3.4.3 Testing

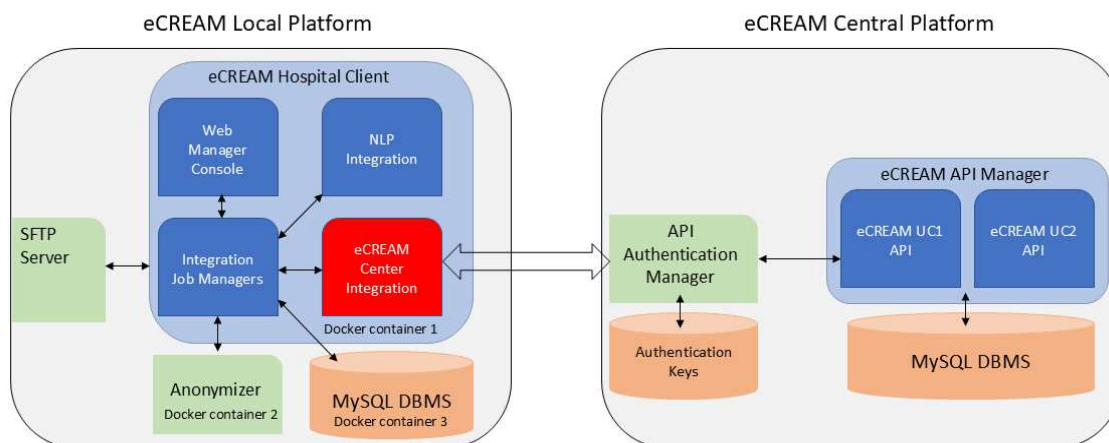
Although the interfaces to the NLP component for the training phase have been developed and included in the local eCREAM environment, the testing phase must be delayed until after the NLP component is made available. The outcome of the testing and specific details will be described in the next periodic report.

## 3.5 eCREAM Hospital Client – eCREAM Centre Integration

### 3.5.1 Development

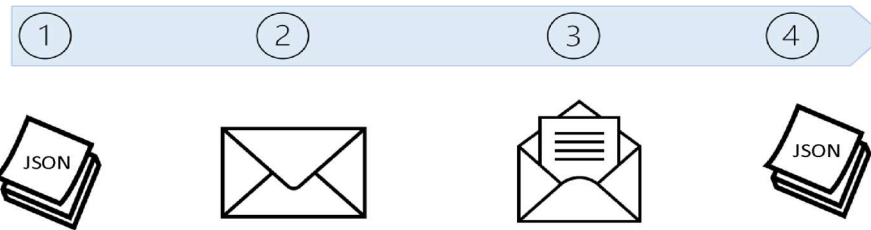
The “eCREAM Centre Integration” component belonging to the eCREAM Hospital Client platform is responsible for data communication with the eCREAM Centre platform; it implements all the data retrieval, processing, and logic sending.

On the central platform, two services contribute to the management of the message: the “API Authentication Manager” component and the “eCREAM API Manager” component. The first manages the message authentication and validation procedure; the second implements API processing via a plug-in architecture.



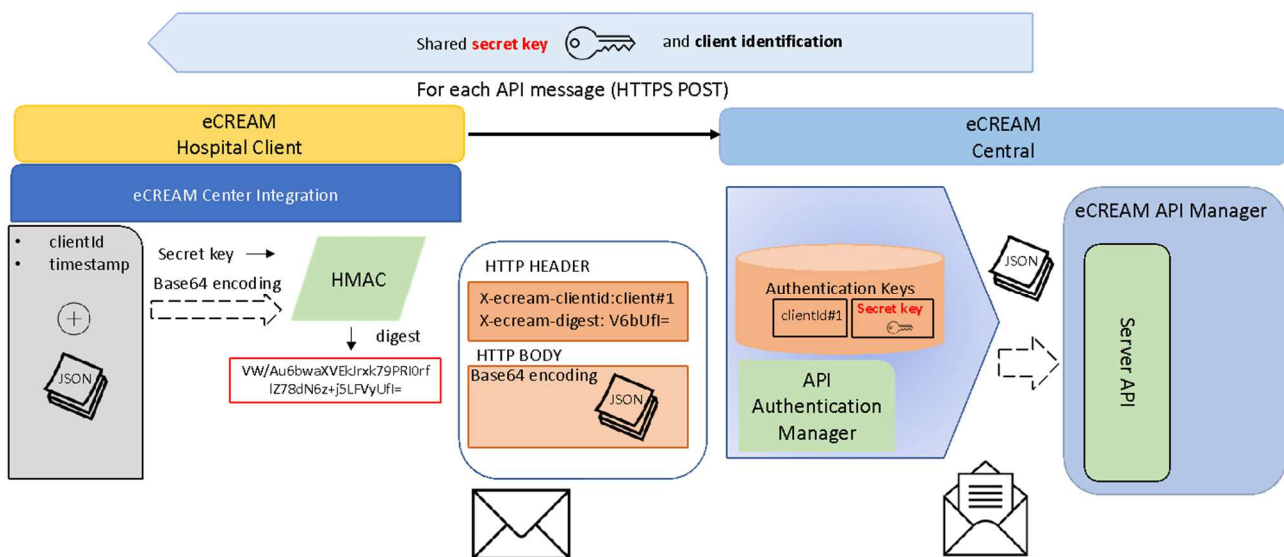
Communication occurs through the invocation of JSON over HTTPS services exposed by the central platform.

All exposed APIs follow the same logical call flow, which can be summarised in the four steps listed in the figure:



1. **eCREAM Centre Integration:** The **first** step is to extract and compose the JSON to send. In relation to the use case to be integrated, the component performs a series of processing on the data imported from the 'Integration Job Manager' component, such as normalisation, indicator calculation, NLP model integration, etc.
2. **eCREAM Centre Integration – authentication procedure:** The JSON is wrapped with the authentication information obtained from the authentication procedure described below.
3. **eCREAM Centre Platform, API Authentication Manager:** The envelope is received by the “API Authentication Manager” component, analysed, and validated. If it is correct, the JSON is extracted.
4. The extracted JSON is sent to the “eCREAM API Manager” component, which is responsible for correctly dispatching the call made by the client.

Next, the details of the design of the implementation of steps two and three of the API call flow are reported: the authentication process.



Each eCREAM Hospital Client installation is characterised by a unique identifier, **clientId**, and a **secret key**. These two elements are stored centrally and shared with a single local platform. The steps performed by the components involved in the authentication flow are described in detail below:

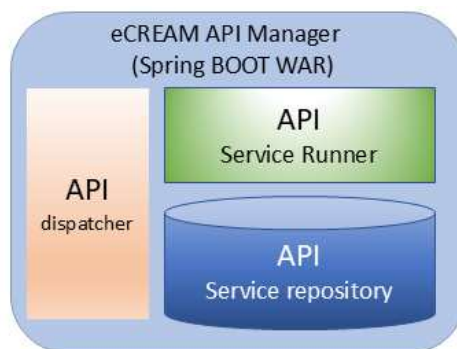
1. The “**CREAM Centre Integration**” component, in relation to the APIs to be called, retrieves the data in JSON format to be sent.
2. Two attributes are added to the retrieved JSON:
  - a. **clientId**: set to the value of the unique identifier associated with the eCREAM Local installation

- b. **timestamp**: the current timestamp.
3. The final JSON is transformed into Base64 format.
4. The digest is calculated with the HMAC protocol using the shared secret key.
5. The HTTPS API is called with a POST command constructed like:
  - a. HTTP Header made up of two elements:
    - i. **X-ecream-clientId**: set to the value of the unique identifier of the installation
    - ii. **X-ecream-digest**: set to the value of the calculated HMAC digest
  - b. HTTP Body formed from the previously calculated Base64.
6. The message is handled by the “**API Authentication Manager**” component:
  - a. Through the value present in X-cream-clientId the secret key is retrieved from the “**Authentication keys repository**”
  - b. The retrieved secret key is used to calculate the HMAC digest of the HTTP body
  - c. The calculated digest is compared to the X-ecream-digest parameter. In case of a negative comparison, an authentication error is generated. If so, the flow continues
  - d. The JSON is extracted through a Base64 decode function
  - e. The clientId attribute present in the JSON is checked for correspondence with the value used to perform the HMAC check. In case of failure, the flow is interrupted with an authentication error
  - f. The value of the timestamp attribute is retrieved from the JSON and compared with the current time on the server. An authentication error is returned if the difference between the JSON field and the server timestamp is greater than 10s.
7. Based on the request API, the resulting JSON will be dispatched to the right service.

The application of the described authentication protocol guarantees:

- Integrity of the message sent
- Caller service authentication with shared secret key and client identification
- Single sending of the message in the 10s interval.

Through a plug-in architecture, the “eCREAM API Manager” service guarantees the dynamic composition of the APIs exposed by the eCREAM Central service. Each service is characterised by a specific access point (URL) and a common application interface consisting of a single method that expects a JSON element as input and JSON as an output.



The individual services installed in the “API Service repository” are responsible for implementing the different application logics defined during the eCREAM project that implement the operational use cases. The defined architecture guarantees the possibility of installing the new necessary services on a common application infrastructure integrated with the various eCREAM Local installations (present in the various hospitals), respecting the timescales defined by the project’s Gantt.

### 3.5.2 Installation

The installation of the eCREAM Integrator interface between Local eCREAM and Central eCREAM starts at the same time as the installation of the eCREAM Hospital Client.

### 3.5.3 Testing

Although the interfaces to the Central eCREAM component were developed and included in the same Local eCREAM environment, the testing phase must necessarily be postponed until after the individual use cases have been defined. The outcome of the tests and specific details will be described in the next periodic report.

#### *Development of the eCREAM interface modules to the new ED-EHR and the MIP*

For the new ED EHR, the FHIR standard chosen by FBK uses REST as the basis for exchanging data in its API. The types of health data (medicines, visits, parameters, patients, etc.) are represented by the related resources. Resources can be requested via a RESTful HTTP command, and interactions such as searches or requests can be used to obtain necessary information.

The activities related to analysis and subsequent development and installation of the interface between the new ED-EHR and the eCREAM Central Office are ongoing; these activities are necessarily postponed until after the availability of the new folder.

The same is true also for the interface to the MIP. An update on both developments will be described in the next periodic report.

## 4. Innovation fostered by T2.4 and T2.5

eCREAM introduces various innovative elements that can be identified across multiple aspects of the project, collectively contributing to the creation of a unique initiative. The following points highlight the key innovations.

- Advanced integration of structured and unstructured data: The project involves extracting clinical and logistical data from hospital systems using a data dictionary and NLP technologies for handling free-text, including unstructured data, which are not typically available in hospital medical records.

- Modular microservices-based architecture: The adoption of a modular architecture based on microservices allows the application to be broken down into small, autonomous services, each focused on specific functional domains, such as authentication, authorization, and clinical and patient data management. This approach facilitates the integration and management of specialized functionalities.
- Interoperability via FHIR standards: The use of interoperability standards like HL7 FHIR for managing clinical data within the new ED-EHR ensures compatibility with other healthcare information systems, enabling smoother communication and integration across different platforms.
- Data security through HMAC: The implementation of the HMAC protocol for message authentication and integrity ensures that communications between various system components are secure, protecting the integrity and authenticity of exchanged information.
- Use of docker for portability and multi-service management: The use of Docker Compose to manage a multi-service environment ensures greater portability and simplifies the management of software dependencies, improving the efficiency of installation and maintenance of local systems.
- Centralized platform with AWS support: The choice of an AWS cloud environment for the implementation of the central platform provides scalability and flexibility, enabling rapid resource allocation according to project progression.
- Integration with NLP technologies for medical text analysis: The use of NLP technologies for analysing free-text extracted from hospital documents represents an advancement in the extraction and structuring of complex clinical data, useful for training NLP models.
- Local preprocessing workflow: The creation of a local data preprocessing pipeline, including normalization and anonymization before transfer to the central platform, ensures the secure and compliant handling of sensitive data.

## 5. Conclusions on the eCREAM interface modules

The objectives of T2.4 and T2.5 are part of a complex and articulated whole; this global view allows for a better design and maximizes the benefits of the final project. Overlooking these connections could lead to inefficiencies or unexpected problems along the way.

Some interfaces connecting the Local eCREAM Platform with eCREAM Central cannot therefore be set up at this time, as they depend on the design and development of modules that will be released later in the central platform. For these components, what was possible so far has been implemented, and what remains outstanding in this deliverable will be addressed in the next periodic report.

The following is a summary of WP2 and WP6 for a better reading of the above.

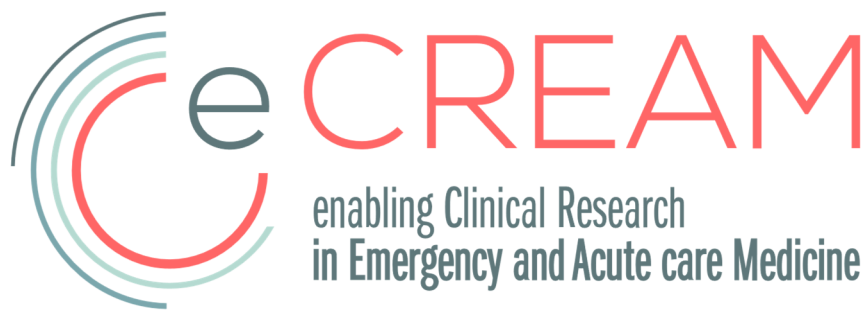
WP	Task	Year 2				Year 3				Year 4			
		T1 - 2	T2 - 2	T3 - 2	T4 - 2	T1 - 3	T2 - 3	T3 - 3	T4 - 3	T1 - 4	T2 - 4	T3 - 4	T4 - 4
2	T2.4												
2	T2.5												
2	T2.6												
6	T6.1												
6	T6.3												
6	T6.4												

## Annexes

Annex 1\_D2.2 - eCREAM variables and FHIR resources mapping

Annex 2\_D2.2 - eCREAM Classification of attributes

Annex 3\_D2.2 - eCREAM Application Interface Specifications UC1 e UC2



# Annex 1

## eCREAM variables and FHIR resources mapping

*Project:* eCREAM

enabling Clinical Research in Emergency and Acute care Medicine through automated data  
extraction

*Call:* HORIZON-HLTH-2021-TOOL-06

*Topic:* HORIZON-HLTH-2021-TOOL-06-03

*Type of action:* HORIZON Research and Innovation Actions

*Grant Agreement no.* 101057726



**Funded by  
the European Union**



## Summary

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2. eCREAM variables and FHIR resources mapping.....	3

## 1. Purpose of the document

This document contains mapping variables and resources FHIR

## 2. eCREAM variables and FHIR resources mapping

SUBSET NAME	FILED NAME	Definition	Mandatory Field	Domain Information	Example	FHIR - Resource	FHIR - Reference	FHIR - Notes
episode			Mandatory	Admission of the patient to the ED.		EpisodeOfCare	<a href="https://www.hl7.org/fhir/episodeofcare.html">https://www.hl7.org/fhir/episodeofcare.html</a>	-
	organizationCode	Unique numeric identification code that is used to identify a hospital within health care and administrative systems.	Mandatory	Alphanumeric string, maximum length: 12 characters.	30987	managingOrganization	<a href="https://www.hl7.org/fhir/organization.html">https://www.hl7.org/fhir/organization.html</a>	-
	emergencyDepartmentId	ID of ED (general, obstetrics, ophthalmology....)	Mandatory	Alphanumeric string, maximum length: 20 characters.		careTeam	<a href="https://www.hl7.org/fhir/careteam.html">https://www.hl7.org/fhir/careteam.html</a>	-
	episodeId	identification ED patient's admission	Mandatory	Alphanumeric string, maximum length: 20 characters.	2024123455	identifier	<a href="https://www.hl7.org/fhir/datatypes.html#Identifier">https://www.hl7.org/fhir/datatypes.html#Identifier</a>	-
	edArrivalDateTime	Date and time of arrival at the ED	Optional	Date format: "YYYY-MM-DDTHH:mm:ss"	2022-06-22T15:13:23	period	<a href="https://www.hl7.org/fhir/datatypes.html#Period">https://www.hl7.org/fhir/datatypes.html#Period</a>	-
	sex	Gender of the patient.	Optional	Allowed values: 1 for Male, 2 for Female, 9 for Not Specified	1	patient	<a href="https://www.hl7.org/fhir/patient.html">https://www.hl7.org/fhir/patient.html</a>	-
	age	The age in years of the patient.	Optional	Format: Alphanumeric string up to 3 characters	42	patient	<a href="https://www.hl7.org/fhir/patient.html">https://www.hl7.org/fhir/patient.html</a>	-
	arrivalModeCode	How the patient arrived at the ED: e.g. by ambulance dispatched by pre-hospital emergency service (EMS), by helicopter dispatched by EMS, transferred from an ED of another Hospital, Self-	Optional	E.r.: 1: Ambulance from 112 , 2: Ambulance from another hospital, 3: Autonomous (by own means), 4: Other (fire department, military ambulance, etc.), 5: Not known. The Hospital has to provide a table containing the description of each code.	3	subjectStatus	<a href="https://www.hl7.org/fhir/encounter.html">https://www.hl7.org/fhir/encounter.html</a>	-

		presented/by their own means						
triage			Optional	Patient triage information.		Encounter	<a href="https://www.hl7.org/fhir/encounter.html">https://www.hl7.org/fhir/encounter.html</a>	-
	triageDateTime	Date and time of triage.	Optional	Date format: "YYYY-MM-DDTHH:mm:ss"	2022-06-22T15:13:23	actualPeriod		
	triagePriority	Priority level code assigned to the patient.	Optional	Allowed values: Code - Description: 1,2,3,4,5,6, X (Not performed) The Hospital has to provide a table containing the description of each code.	2	subjectStatus		
	triageNotes	The field contains triage notes including medications and drugs taken at home, allergies, known pathologies collected at triage etc.	Optional	Format: Alphanumeric string up to 400 characters	Patient presented with severe chest pain and difficulty breathing. History of heart disease.	note		
	mainClinicalProblem	Main clinical problem and symptoms detected during the triage evaluation	Optional	E.g.: 1 - Coma, 2 - Acute neurological syndrome, 3 - Other nervous system symptoms, 4 - Abdominal pain, 5 - Chest pain, 6 - Dyspnoea, etc. The Hospital has to provide a table containing the description of each code.	14	reason		

<b>turnarou ndTime</b>		The turnaround time (the time taken for ambulance crew to handover the patient and restock the vehicle so it is ready to attend another call) is taken from the time of arrival of the ambulance at the receiving hospital to the time the ambulance “clears” becomes available. This includes the time taken to wait to handover a patient to the care of the hospital staff plus any additional time they spend at hospital.	Option al					Custom and much related to the EMS
				Date format: "YYYY-MM-DDTHH:mm:ss".				
<b>pathAssi gnmentL ist</b>			Option al	Filled with as many elements of the pathAssignment entity as the path assignment. If, for example, a patient first referred to an Ophthalmic Fast-Track pathway and later referred to the Low Complexity Area pathway, there must be two elements of the assignmentPathwayPS entity-one for the Ophthalmic Fast-Track and the other for the Low Complexity Area pathway				
	edPathAssig nmentDateT ime	Date and hour of the path assignment of the patient	Option al	Date format: "YYYY-MM-DDTHH:mm:ss"				

	pathCode	ED path identification code	Optional	E.g.: 1. High complexity area; 2. Low complexity area; 3. Paediatric fast-track; 4. Ophthalmologic fast-track				
revaluationList		List of re-evaluation of the patient's triage/priority level	Optional					Just like the triage
	revaluationTime	Date and hour of the re-evaluation of the patient's triage/priority level	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23			
	newPriorityLevel	New priority level code assigned to the patient	Optional	Allowed values: Code - Description: 1,2,3,4,5,6, X (Not performed). The Hospital has to provide a table containing the description of each code.	2			
anamnesis		Patient's medical history information. The taking of a patient's personal medical history	Optional	Format: Alphanumeric string up to 400 characters	The patient reports a recent onset of persistent cough with yellowish-green sputum, low-grade fever, and fatigue. No history of recent travel or exposure to sick individuals. Non-smoker. No known respiratory conditions.	EncounterHistory	<a href="https://hl7.org/fhir/encounterhistory.html">https://hl7.org/fhir/encounterhistory.html</a>	

homeBasedTherapy		Patient's home based therapy.	Optional	Format: alphanumeric string up to 4000 characters.	The patient has been prescribed a 10-day course of antibiotics (Amoxicillin 500mg, twice daily) for a confirmed bacterial infection. Patient advised to complete the full course and follow up if symptoms persist or worsen. Education provided on proper medication administration and potential side effects.	CarePlan.description	<a href="https://hl7.org/fhir/careplan.html">https://hl7.org/fhir/careplan.html</a>	
medicalVisitsList		List of patient's medical visits.	Optional	Filled with as many elements of the medicalVisits entity as there are patient visits.		Encounter	<a href="https://www.hl7.org/fhir/encounter.html">https://www.hl7.org/fhir/encounter.html</a>	
	dateTimeMedicalVisit	Date and time of doctor's taking on of the patient,	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	actualPeriod		

	medicalVisitOutcome	Field filled with the outcome of visit.	Optional	Format: Alphanumeric string up to 2000 characters.	The patient presented with persistent abdominal pain and nausea. Physical examination revealed tenderness in the right lower quadrant. Laboratory tests ordered for complete blood count and abdominal ultrasound scheduled for further evaluation. Prescribed pain medication and advised on dietary modifications. Follow-up appointment scheduled in one week.	diagnosis	-	
nursingCareStart		Date and time of the start of nursing care for the patient	Optional	Date and time of the start of nursing care for the patient Date format: "YYYY-MM-DDTHH:mm:ss".		Encounter.actualPeriod	<a href="https://www.hl7.org/fhir/encounter.html">https://www.hl7.org/fhir/encounter.html</a>	

imagingTestList		List of patient's imaging test.	Optional	Filled with as many elements of the imaging test entity as there are imaging test.		DiagnosticReport	<a href="https://hl7.org/fhir/diagnosticreport.html">https://hl7.org/fhir/diagnosticreport.html</a>	
	requestId	Field constructed from the concatenation between the ED event (episodeID) and the request number. The request number is generated by the ED system when the exam is requested (booked) on an external system (RIS, LIS; other EHR).	Mandatory	It is a unique value. Format: Alphanumeric string up to 40 characters.	2024123455_122359	study	<a href="https://hl7.org/fhir/imagingstudy.html">https://hl7.org/fhir/imagingstudy.html</a>	Reference to ImagingStudy
	dateTimeRequestImagingTest	Date and time of the request for imaging the test.	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	study		
	dateTimeImagingTestExecution	Date and time of the execution of the imaging test.	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:14:23	study		
	dateTimeImagingTestReport	Date and time of the imaging test report	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:15:23	study		
	imagingTestCode	Code of the imaging test	Optional	coded field with imaging test. If Dyspnoea: US, Head/neck CT, Chest CT, Chest Rx, if TLoC: Brain CT scan, Brain MRI, US cardiac, Chest CT scan, Pulmonary scintigraphy, Gastroscopy, Abdomen CT scan It is necessary to receive the decoding table.	77723	conclusion		

					Clear lung fields with no signs of consolidation or infiltrates. No evidence of fractures or abnormalities. Normal cardiac silhouette.	conclusion		
	imagingTestReportText	Report of the imaging tests (CT, CR, etc.).	Optional	Format: Alphanumeric string up to 2000 characters.				
labTestList		List of patient's lab test.	Optional	Populated with as many elements of the imagingTestExecution entity as there are imaging tests.		DiagnosticReport	<a href="https://hl7.org/fhir/diagnosticreport.html">https://hl7.org/fhir/diagnosticreport.html</a>	
	requestId	Field constructed from the concatenation between the ED event (episodeID) and the request number. The request number is generated by the ED system when the exam is requested (booked) on an external system (RIS, LIS; other EHR).	Mandatory	It is a unique value. Format: Alphanumeric string up to 40 characters.	2024123455_122359	basedOn		

	labTestDescription	Description of the LabTest.	Optional	coded field with description of the laboratory test. If Dyspnoea: pH,,PaO2 ,PaCO2 ,HCO3 ,Lactates ,Haemoglobin ,Platelets ,Leukocytes ,CReactiveProtein ,bloodGlucose ,bloodSodium ,bloodPotatium ,Creatinine ,Transaminases ,INR,Troponin ,BNP,DDimer ,SARSCoV2swabTest if TLoC: Lactates, Haemoglobin ,Platelets ,Leukocytes ,CReactiveProtein ,bloodGlucose ,bloodSodium ,bloodPotatium ,bloodCalcium ,Creatinine ,Transaminases,INR ,Troponin ,BNP ,DDimer ,CreatineKinase ,BloodAlcohol ,BloodDrug ,UrineDrug	glucose	note	
	dateTimeLabTestRequest	Date and time of the request for the lab test	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	basedOn	
	dateTimeLabTestExecution	Date and time of the lab test execution	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:14:23	effective	
	labTestResults	Result of the lab test.	Optional	Format: Alphanumeric string up to 20 characters.	123	conclusion	
	unitOfMeasureLabTest	Unit of measure for the result.	Mandatory Conditional	if NumericResults is valued. Allowed values, for example: mg/dL, g/dL, U/L, mmol/L ,%, 10^12/L, 10^9/L, pg, fL, U/L, ratio, sec, INR	mg/dL	conclusion	

otherTestList		List of patient's other test.	Optional	Populated with as many elements of the imagingTestExecution entity as there are imaging tests.		DiagnosticReport	<a href="https://hl7.org/fhir/diagnosticreport.html">https://hl7.org/fhir/diagnosticreport.html</a>	
	requestId	Field constructed from the concatenation between the ED event (episodeID) and the request number. The request number is generated by the ED system when the exam is requested (booked) on an external system (RIS, LIS; other EHR).	Mandatory	It is a unique value. Format: Alphanumeric string up to 40 characters.	2024123455_122333356			
	dateTimeRequestOtherTest	Date and time of the request other test	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23			
	dateTimeOtherTestExecution	Date and time of the other test execution	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:14:23			
	dateTimeOtherTestReport	Date and time of the other test report	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:15:23			
	otherTestCode	Code of the other test	Optional	Format: Alphanumeric string up to 400 characters. The Hospital has to provide a table containing the description of each code.	532			
	otherTestReportText	Filed filed reporting the results of the other tests (ECG, EEG, gastroscopy etc.).	Optional	Field filed reporting the results of the other tests (ECG, EEG, gastroscopy etc.).	ECG waveform within normal limits			
vitalParameterList		List of patient vital signs.	Optional	List of patient vital signs. Populated with as many elements of the "vitalParameters" entity as there are patient data collections.		Observation	<a href="https://hl7.org/fhir/observation.html">https://hl7.org/fhir/observation.html</a>	one observation per VP

	dateTimeDetection	Vital signs monitoring start date and hour	Optional	Date format: "YYYY-MM-DDTHH:mm:ss"	2022-06-22T15:15:23	value.valueDateTime		
	systolicPressure	Systolic pressure at triage	Optional	String value from 0 to 3 digits, unit of measure mmHg	100			
	diastolicPressure	Diastolic pressure at triage.	Optional	String value from 0 to 3 digits, unit of measure mmHg	120			
	heartRate	Heart rate at triage.	Optional	String value from 0 to 3 digits, unit of measure Bpm	75			
	respiratoryRate	Respiratory rate at triage.	Optional	String value from 0 to 2 digits, unit of measure breaths/minute	18			
	bodyTemperature	Body temperature at triage.	Optional	String value (2 digits, 1 digit after the separator) unit of measure degrees Celsius	38.3			
	levelConsciousness	level of consciousness	Optional	The AVPU scale (Alert, Voice, Pain, Unresponsive) to measure and record the patient's level of consciousness (4 levels: AVPU). Allowed values: 1 – Alert, 2 – Voice, 3 – Pain, 4 – Unresponsive	2			
	spO2	Oxygen saturation detected at triage	Optional	String value to 2 digits	95			
nursingCareNotesList	vitalParametersText	Field used alternatively or in addition to compiling structured data. Contains list of vital signs or clinical examination.	Optional	Format: Alphanumeric string up to 400 characters.	Heart Rate: 98 bpm Respiratory Rate: 20	note		
		List of nursing care of the patient.	Optional	Nursing care of the patient.		Procedure	<a href="https://www.hl7.org/fhir/procedure.html">https://www.hl7.org/fhir/procedure.html</a>	
	dateTimeNote	Date and time of nurse's taking on of the patient	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T1:13:23	occurrence.occurrenceDateTime		

	nursingNotes	Field filled with nursing notes.	Optional	Format: Alphanumeric string up to 2000 characters.	Patient received prompt percutaneous coronary intervention (PPCI) for acute myocardial infarction. Vital signs monitored closely for the first 6 hours post-procedure. No complications observed. Patient remained stable and comfortable. Provided education on post-PPCI care and scheduled follow-up appointments.	note	<a href="https://www.hl7.org/fhir/annotation.html">https://www.hl7.org/fhir/annotation.html</a>	
clinicalDiaryList		Information regarding the patient's clinical diary	Optional			Procedure	A) <a href="https://www.hl7.org/fhir/procedure.html">https://www.hl7.org/fhir/procedure.html</a> B) <a href="https://www.hl7.org/fhir/clinicalimpresession.html">https://www.hl7.org/fhir/clinicalimpresession.html</a>	

	dateTimeClinicalDiary	Date and time of filling of the clinical diary	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".		occurrence.occurrenceDateTime		
	clinicalDiary	Field that contains clinical care data and treatment	Optional	Format: Alphanumeric string up to 2000 characters.	Patient admitted with a history of chronic obstructive pulmonary disease (COPD) exacerbation. Received nebulized bronchodilators and systemic corticosteroids. Respiratory distress improved over the next 24 hours. Continued close monitoring of oxygen saturation and respiratory rate. Introduced physiotherapy sessions for airway clearance. Patient	note / summary	<a href="https://www.hl7.org/fhir/annotation.html">https://www.hl7.org/fhir/annotation.html</a>	

					responding well to treatment. Daily assessments scheduled to track progress.			
medical ProcedureList		List of medical procedures (specific surgical, medical, or diagnostic interventions) in ED	Optional			Procedure	<a href="https://www.hl7.org/fhir/procedure.html">https://www.hl7.org/fhir/procedure.html</a>	

	dateTimeRequestMedicalProcedure	Date and time of the medical procedure request	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	basedOn	A request for this procedure	
	dateTimeExecutionMedicalProcedure	Date and time of the medical procedure execution	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	occurrence.occurrenceDateTime		
	medicalProcedureCode	Code of the medical procedure	Optional	Format: Alphanumeric string up to 400 characters. The Hospital has to provide a table containing the description of each code.	318	code		
specialistConsultancyList		List of patient's specialist consultancy.	Optional	Specialist patient consultations. Filled with as many consultations as there are consultations performed.		Encounter	<a href="https://www.hl7.org/fhir/encounter.html">https://www.hl7.org/fhir/encounter.html</a>	
	requestId	Field constructed from the concatenation between the ED event (episodeID) and the request number. The request number is generated by the ED system when the exam is requested (booked) on an external system (RIS, LIS; other EHR).	Mandatory	It is a unique value. Format: Alphanumeric string up to 40 characters.	2024123455_3556	basedOn	The request that initiated this encounter	
	consultancyType	Contains the type of consultancy requested.	Optional	Format: Alphanumeric string up to 50 characters.	Cardiology Consultation	type		
	dateTimeSpecialistConsultancy	Date and time of patient specialist consultancy	Optional	Date format: "YYYY-MM-DDTHH:mm:ss"	2022-06-22T15:15:23	actualPeriod		

	reportTextSpecialistConsultancy	Filled in field reporting the outcome of the specialist consultancy.	Optional	Format: Alphanumeric string up to 2000 characters.	The patient with a history of hypertension and chest pain underwent a thorough cardiac evaluation. ECG and echocardiogram performed, revealing no significant abnormalities. Recommended lifestyle modifications, continued antihypertensive medication, and scheduled a follow-up visit in three months.	diagnosis		
pharmaceuticalTherapyList		List of pharmaceutical therapy prescription and administration.	Optional			MedicationAdministration	<a href="https://www.hl7.org/fhir/medicationadministration.html">https://www.hl7.org/fhir/medicationadministration.html</a>	
	dateTimeTherapyPrescription	Pharmaceutical therapy administration - date and hour	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	request	<a href="https://www.hl7.org/fhir/medicationrequest.html">https://www.hl7.org/fhir/medicationrequest.html</a>	Reference to

								Medication Request
	dateTimeTherapyAdministration	Pharmaceutical therapy administration - date and hour	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	occurrence.occurrenceDateTime		Reference
	therapyType	Type of therapy administered.	Optional	Format: Alphanumeric string up to 200 characters.	34563	medication	<a href="https://www.hl7.org/fhir/medication.html">https://www.hl7.org/fhir/medication.html</a>	SNO MED CT Medication Codes
respiratorySupportList		List of respiratory support.	Optional			Observation	<a href="https://www.hl7.org/fhir/observation.html">https://www.hl7.org/fhir/observation.html</a>	
	startTimeRespiratorySupport	Respiratory support start date and hour	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	value.valuePeriod		
	endTimeRespiratorySupport	Respiratory support end date and hour	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:17:32	value.valuePeriod		
monitoringList		List of monitoringList.	Optional			Observation	<a href="https://www.hl7.org/fhir/observation.html">https://www.hl7.org/fhir/observation.html</a>	Device measurements such as EKG data or Pulse Oximetry data
	startTimeMonitoring	Monitoring start date and hour	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	value.valuePeriod		

	endTimeMonitoring	Monitoring end date and hour	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:17:32	value.valuePeriod		
discharge		List final diagnosis. Populated with as many elements of the finalDiagnosisList entity as the final diagnoses.	Optional			Composition	<a href="https://www.hl7.org/fhir/document-example-dischargesummary.html">https://www.hl7.org/fhir/document-example-dischargesummary.html</a>	A set of health care-related information that is assembled together into a single logical package that provides a single coherent statement of meaning.
	dischargeDecisionDate Time	Date and time of the admission/transfer to another hospital/discharge decision, in case the patient has to wait for a bed or a transfer to	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	Encounter.plannedStartDate		

		another hospital (admission).						
	dischargedDateTime	Date and time of patient discharge from the ER.	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	Encounter.actualPeriod		
	modeOfExit	Mode of exit (admitted/transferred/deceased/voluntary abandonment)	Optional	Allowed values: 1- if admitted, 2 - if transferred, 3 - if decease,4 - if voluntary abandonment.	3	Encounter.type		
	diagnosisAtEDDischarge	Diagnosis at the end of ED hospitalisation	Optional	Format: Alphanumeric string up to 2000 characters.	OTHER CHEST PAIN	Encounter.diagnosis		

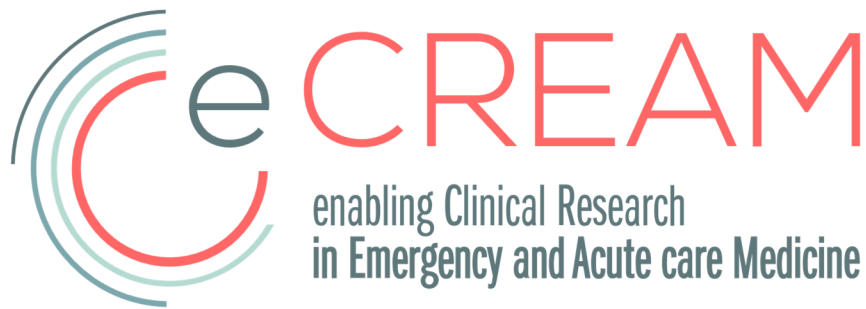
	dischargeNotes	Field filled with discharge notes, included clinical ED Outcome, ED Discharge Care Plan, ED Discharging Pharmacological Therapy and clinical Condition at Discharge	Optional	Format: Alphanumeric string up to 2000 characters.	The patient presented with symptoms of pneumonia and received appropriate treatment during their hospital stay. Clinical condition has significantly improved, and vital signs are stable. The patient is discharged home with a prescription for antibiotics, analgesics, and instructions for continued care. Advised to follow up with the primary care physician	Encounter.admission.dischargeDisposition		
--	----------------	---	----------	--	--	--	--	--

					in one week for further evaluation and monitoring. Provided education on signs and symptoms warranting immediate medical attention. Patient and family informed and engaged in the discharge plan.			
obsUnit		Set of information relating to the patient's presence in the Obs Unit	Optional			Encounter	<a href="https://www.hl7.org/fhir/encounter.html">https://www.hl7.org/fhir/encounter.html</a>	

# Annex 1 - Mapping variables and resources FHIR



	decisionObsUnit	Date and time of decision to transfer to Short Stay Observation Unit	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	plannedStartDate	<a href="https://www.hl7.org/fhir/datatypes.html#dateTime">https://www.hl7.org/fhir/datatypes.html#dateTime</a>	
	transferObsUnit	Date and time of transfer to Observation Unit	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	actualPeriod	<a href="https://www.hl7.org/fhir/datatypes.html#Period">https://www.hl7.org/fhir/datatypes.html#Period</a>	
	exitObsUnit	Date and time of exit from ED/Observation Unit	Optional	Date format: "YYYY-MM-DDTHH:mm:ss".	2022-06-22T15:13:23	actualPeriod	<a href="https://www.hl7.org/fhir/datatypes.html#Period">https://www.hl7.org/fhir/datatypes.html#Period</a>	



## Annex 2

# Classification of attributes associated with the eCREAM model

*Project:* eCREAM

enabling Clinical Research in Emergency and Acute care Medicine through automated data extraction

*Call:* HORIZON-HLTH-2021-TOOL-06

*Topic:* HORIZON-HLTH-2021-TOOL-06-03

*Type of action:* HORIZON Research and Innovation Actions

*Grant Agreement no.* 101057726



**Funded by  
the European Union**

## Summary

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2. Classification of attributes associated with the eCREAM model .....	3

## 1. Purpose of the document

This document contains classification of data of a different nature (clinical, logistical, documentary) and come from different sources (emergency room medical records, laboratory analyses and radiology systems).

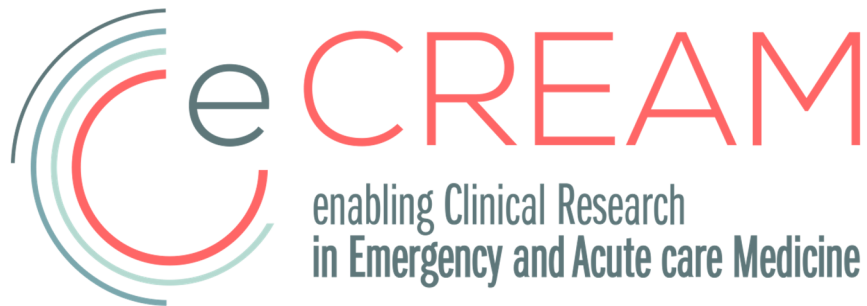
## 2. Classification of attributes associated with the eCREAM model

The information constituting a single emergency room access episode may be composed of data of a different nature (clinical, logistical, documentary) and come from different sources (emergency room medical records, laboratory analyses and radiology systems). The eCREAM Hospital Client component is designed to manage information flows from different sources in different combinations according to the hospital configuration. Below is the classification of data by different nature: clinical, logistical, documental or data from external sources (PDF reports).

Elements	Field name	KEY	CLINIC	LOGISTI C	DOCUMENT	PDF	DOCUMENT CATEGORY
<b>episode</b>		1	1	1	1		
episode	organizationCode		1	1			
episode	emergencyDepartmentId	1	1	1	1		
episode	episodeId	1	1	1	1		
episode	edArrivalDateTime			1			
episode	sex		1				
episode	age		1	1			
episode	arrivalModeCode			1			
<b>triage</b>			1	1	1		
triage	triageDateTime			1			
triage	triagePriority			1			
triage	triageNotes				1		TRIAGE
triage	mainClinicalProblem		1				
triage	secondaryClinicalProblem				1		TRIAGE
<b>turnaroundTime</b>			1				
<b>pathAssignmentList: Array of pathAssignment</b>			1				
pathAssignmentList: Array of pathAssignment	idObject	1	1				
pathAssignmentList: Array of pathAssignment	edPathAssignmentDateTim		1				
pathAssignmentList: Array of pathAssignment	pathCode		1				
<b>revaluationList: Array of revaluation</b>			1				
revaluationList: Array of revaluation	idObject		1				
revaluationList: Array of revaluation	revaluationTime		1				
revaluationList: Array of revaluation	newPriorityLevel		1				
<b>anamnesis</b>					1		ANAMNESIS
<b>homeBasedTherapy</b>					1		HOME_BASED_THERAPY
<b>medicalVisitList Array of medicalVisit</b>			1		1		
medicalVisitList Array of medicalVisit	idObject	1	1		1		
medicalVisitList Array of medicalVisit	dateTimeMedicalVisit		1				
medicalVisitList Array of medicalVisit	medicalVisitOutcome				1		MEDICAL_VISIT

nursingCareStart			1				
<b>imagingTestList array of imagingTest</b>			<b>1</b>		<b>1</b>	<b>1</b>	RIS
imagingTestList array of imagingTest	objectId	1	1		1		
imagingTestList array of imagingTest	requestId				1		
imagingTestList array of imagingTest	dateTimeRequestImagingTest		1				
imagingTestList array of imagingTest	dateTimeImagingTestExecution		1				
imagingTestList array of imagingTest	dateTimeImagingTestReport		1				
imagingTestList array of imagingTest	imagingTestCode		1				
imagingTestList array of imagingTest	imagingTestReportText				1		RIS
<b>labTestList array of labTest</b>		<b>1</b>	<b>1</b>			<b>1</b>	LAB
labTestList array of labTest	objectId	1	1				
labTestList array of labTest	requestId		1				
labTestList array of labTest	labTestCode		1				
labTestList array of labTest	labTestDescription		1				
labTestList array of labTest	dateTimeLabTestRequest		1				
labTestList array of labTest	dateTimeLabTestExecution		1				
labTestList array of labTest	labTestResults		1				
labTestList array of labTest	unitOfMeasureLabTest		1				
<b>otherTestList array of otherTest</b>		<b>1</b>	<b>1</b>		<b>1</b>	<b>1</b>	OTHER_TEST
otherTestList array of otherTest	idObject	1	1		1		
otherTestList array of otherTest	requestId				1		
otherTestList array of otherTest	dateTimeRequestOtherTest		1				
otherTestList array of otherTest	dateTimeOtherTestExecution		1				
otherTestList array of otherTest	dateTimeOtherTestReport		1				
otherTestList array of otherTest	otherTestCode		1				
otherTestList array of otherTest	otherTestReportText				1		OTHER_TEST
<b>vitalParametersList array of vitalParameter</b>			<b>1</b>		<b>1</b>		
vitalParametersList array of vitalParameter	idObject	1	1		1		
vitalParametersList array of vitalParameter	dateTimeDetection		1				
vitalParametersList array of vitalParameter	systolicPressure		1				
vitalParametersList array of vitalParameter	diastolicPressure		1				
vitalParametersList array of vitalParameter	heartRate		1				
vitalParametersList array of vitalParameter	respiratoryRate		1				
vitalParametersList array of vitalParameter	bodyTemperature		1				
vitalParametersList array of vitalParameter	spO2		1				
vitalParametersList array of vitalParameter	levelConsciousness		1				
vitalParametersList array of vitalParameter	vitalParametersText				1		VITAL_PARAMETERS
<b>nursingCareNotesList array of nursingCareNote</b>					<b>1</b>		
nursingCareNotesList array of nursingCareNote	idObject	1			1		
nursingCareNotesList array of nursingCareNote	dateTimeNote				1		
nursingCareNotesList array of nursingCareNote	nursingNote				1		NURSING_CARE_NOTES

<b>clinicalDiaryList array of clinicalDiary</b>					1		
clinicalDiaryList array of clinicalDiary	idObject	1			1		
clinicalDiaryList array of clinicalDiary	dateTimeClinicalDiary				1		
clinicalDiaryList array of clinicalDiary	clinicalDiary				1		CLINICAL_DIARY
<b>medicalProcedureList array of medicalProcedure</b>			1				
medicalProcedureList array of medicalProcedure	idObject		1				
medicalProcedureList array of medicalProcedure	dateTimeRequestMedicalProcedure		1				
medicalProcedureList array of medicalProcedure	dateTimeExecutionMedicalProcedure		1				
medicalProcedureList array of medicalProcedure	medicalProcedureCode		1				
<b>specialistConsultancyList array of specialistConsultancy</b>		1	1		1		
specialistConsultancyList array of specialistConsultancy	idObject	1	1		1		
specialistConsultancyList array of specialistConsultancy	requestId				1		
specialistConsultancyList array of specialistConsultancy	consultancyType		1				
specialistConsultancyList array of specialistConsultancy	dateTimeSpecialistConsultancy		1				
specialistConsultancyList array of specialistConsultancy	reportTextSpecialistConsultancy				1		SPECIALIST_CONSULTANCY
<b>pharmaceuticalTherapyList array of pharmaceuticalTherapy</b>			1				
pharmaceuticalTherapyList array of pharmaceuticalTherapy	idObject	1	1				
pharmaceuticalTherapyList array of pharmaceuticalTherapy	dateTimeTherapyPrescription		1				
pharmaceuticalTherapyList array of pharmaceuticalTherapy	dateTimeTherapyAdministration		1				
pharmaceuticalTherapyList array of pharmaceuticalTherapy	therapyType		1				
<b>respiratorySupportList array of respiratorySupport</b>				1			
respiratorySupportList array of respiratorySupport	idObject			1			
respiratorySupportList array of respiratorySupport	startTimeRespiratorySupport			1			
respiratorySupportList array of respiratorySupport	endTimeRespiratorySupport			1			
<b>monitoringList array of monitoring</b>				1			
monitoringList array of monitoring	idObject	1		1			
monitoringList array of monitoring	startTimeMonitoring			1			
monitoringList array of monitoring	endTimeMonitoring			1			
<b>discharge</b>			1	1	1		
discharge	dischargeDecisionDateTime			1			
discharge	dischargeDateTime,			1			
discharge	modeOfExit		1				
discharge	diagnosisAtEDDischarge				1		
discharge	dischargeNotes				1		DISCHARGE
<b>obsUnit</b>				1			
obsUnit	decisionObsUnit			1			
obsUnit	transferObsUnit			1			
obsUnit	exitObsUnit			1			



## Annex 3

# Application Interface Specifications UC1 and UC2

*Project:* eCREAM

enabling Clinical Research in Emergency and Acute care Medicine through automated data  
extraction

*Call:* HORIZON-HLTH-2021-TOOL-06

*Topic:* HORIZON-HLTH-2021-TOOL-06-03

*Type of action:* HORIZON Research and Innovation Actions

*Grant Agreement no.* 101057726



**Funded by  
the European Union**

## Summary

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## 1. Version information

This document is subject to version control. The current version is specified below:

Version: 3.0

Date: July 22, 2024

## 2. Introduction

### Scope

This document aims to define the methods of interaction between the Emergency Department systems and the flows UC1 e UC2 that feed the system.

The data originate from the medical records of the entities participating in the eCREAM project and will follow a path aimed at collecting the necessary information for research purposes, calculating the propensity for hospitalisation, and monitoring the status of emergency departments. They will feed into the central eCREAM database.

Through the UC1 and UC2 flow it is possible to export the data from the hospitals with a JSON objects.

### Definition e acronyms

Name	Description
ED	Emergency Department
RIS	Radiology Information System
LIS	Laboratory Information System
EHR	Electronic Health Record
UC1	Use case 1: to export the data from the hospital with a JSON object
UC2	Use case 2: to export the data from the hospital with a JSON object

### 3. Actors

#### Service provider and service user

The data come from the medical records of participants in the eCREAM project and will be used to gather research-relevant information, assess the likelihood of hospitalization (UC1), and track the status of emergency departments (UC2). This data will be incorporated into the central eCREAM database.

#### **Platform Architecture**

The core infrastructure will be set up on a cloud-based platform.

For the local infrastructure, the hospital facility will need to supply either a physical or virtual server to host a Docker container. This container will facilitate the insertion of data gathered from the hospital facilities, interact with an anonymization tool within the hospital, and then transmit the anonymized data to the central component.

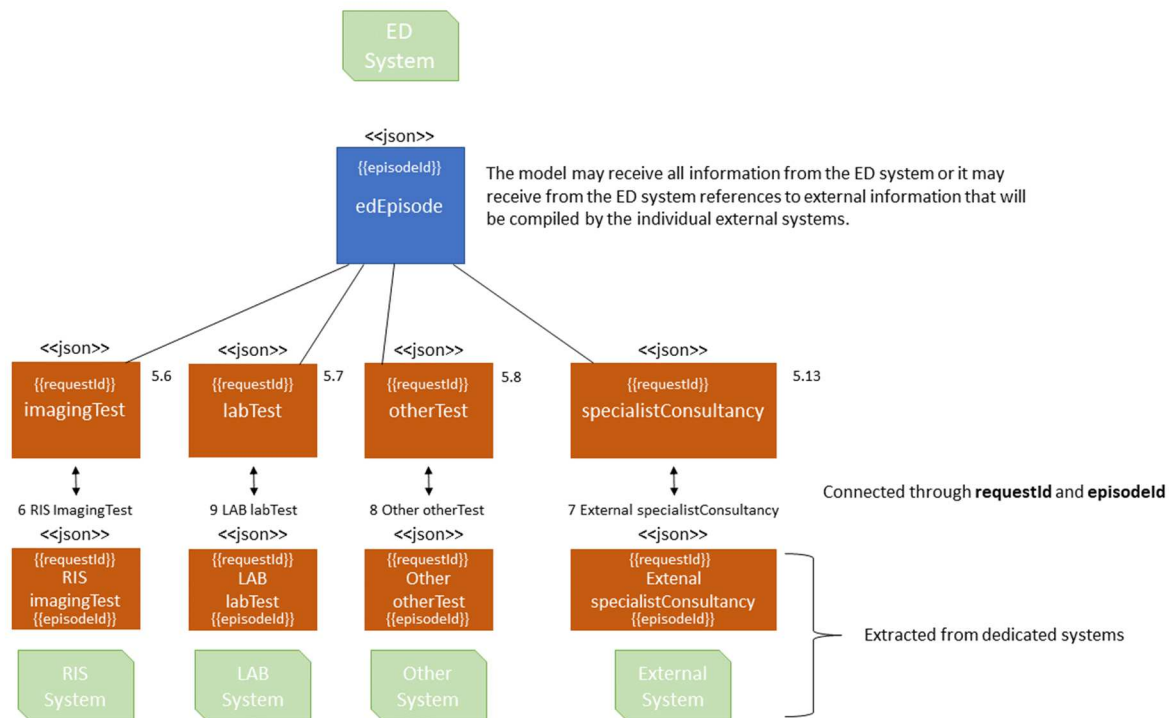
The decision between a physical or virtual solution for the server component is at the discretion of the company's information systems. Nevertheless, the server must satisfy the following minimum requirements:

- CPU: 16 Core
- RAM: 32 GB
- Local drive: 100 GB
- External drive: 500 GB

In addition, each entity necessitates external VPN access to ensure that Astir system administrators can reach the Docker machine for essential maintenance tasks. The Docker machine must be able to establish external connections for data transfer to the central eCream component.

#### How to extract data

The data to be extracted can be found in different systems, and depending on the hospital's level of integration, it can be extracted only from the ER chart or from the ER chart together with other systems such as RIS, LIS and other EHRs.



We describe two cases.

**Case A:** All information can be extracted from the ER chart, which as the Order Placer, generates the orders for the various services and distributes them to the dispensing systems where the service will be performed (RIS, LIS, other medical record). This is the best situation.

In turn, the Order Filler system (RIS, LIS other EHR) will provide the necessary functions to manage order requests received from the ER and execute them.

Thus, the **edEpisode** entity collects all the information in the ED and about examinations requested by the ER but performed by external systems.

The point of connection between requesting and delivering system is through the **requestId** field, a unique identifier given by the concatenation of the EHR event and the request number that is generated by the ED system when the exam is booked on an external system (RIS, LIS, other EHRs).

**Case B:** Information is extracted separately from individual folders where the service is requested (ED) and where it is accepted and performed (RIS, LIS, other EHR)-worst situation.

Several entities will then collect the necessary information from the various folders, in detail:

- **edEpisode Entity:** contains the information extracted from the ED
- **imagingTest Entity:** contains information extracted from the RIS related to radiology examination service requests related to the ED episode
- **labTestList Entity:** contains information extracted from the LIS related to lab test requests linked to the ED episode
- **specialistConsultancy Entity and otherTest Entity:** contain information extracted from other EHRs referring to requests for counselling visits or other examinations related to the ED episode

However, there are intermediate situations.  
 Some example files are attached.

### Coded data

Some data in the various entities are required in coded form, e.g: triagePriority, mainClinicalProblem, newPriorityLevel, imagingTestCode, otherTestCode, medicalProcedureCode.

The Hospital has to provide a table containing the description of each code.

## 4. edEpisode Entity

The {useCasesUC1UC2} entity is the set of data to be managed for UC1 and UC2 of the eCREAM project and is described through the following JSON object:

```
{
  "episode": {episode},
  "triage": {triage},
  "turnaroundTime": "2022-06-22T15:13:23",
  "pathAssignmentList": [{pathAssignment}],
  "reevaluationList": [{reevaluation}],
  "anamnesis": "anamnesis",
  "homeBasedTherapy": "homeBasedTherapy",
  "medicalVisitList": [{medicalVisit}],
  "nursingCareStart": "2022-06-22T15:13:23",
  "imagingTestList": [{imagingTest}],
  "labTestList": [{labTestList}],
  "otherTestList": [{otherTestList}],
  "vitalParametersList": [{vitalParameter}],
  "nursingCareNotesList": [{nursingCareNote}],
  "clinicalDiaryList": [{clinicalDiary}],
  "medicalProcedureList": [{medicalProcedure}],
  "specialistConsultancyList": [{specialistConsultancy}],
  "pharmaceuticalTherapyList": [{pharmaceuticalTherapy}],
  "respiratorySupportList": [{respiratorySupport}],
  "monitoringList": [{monitoring}],
  "discharge": {discharge},
  "obsUnit": {obsUnit}
}
```

Where:

<b>episode</b>	episode	MANDATORY
Patient access in ED. The description of the episode entity is in the “ <b>episode entity</b> ” section		
<b>triage</b>	triage	OPTIONAL
Patient triage information. The description of the triage entity is in the “ <b>triage entity</b> ” section		
<b>turnaroundTime</b>	String	OPTIONAL
The turnaround time (the time taken for the ambulance crew to handover the patient and restock the vehicle, so it is ready to attend another call) is taken from the time of arrival of the ambulance at the receiving hospital to the time the ambulance “clears” becomes available. This includes the time taken to wait to handover a patient to the care of the hospital staff plus any additional time they spend at hospital.		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>pathAssignmentList</b>	List	OPTIONAL
List of path assignments of the patient's.		

Filled with as many elements of the pathAssignment entity as the path assignment. If, for example, a patient first referred to an Ophthalmic Fast-Track pathway and later referred to the Low Complexity Area pathway, there must be two elements of the assignment pathway PS entity-one for the Ophthalmic Fast-Track and the other for the Low Complexity Area pathway

The description of the pathAssignment entity is in the “**pathAssignment entity**” section,

<b>reevaluationList</b>	List	OPTIONAL
-------------------------	------	----------

List of reevaluation of the patient's triage/priority level

Filled with as many elements of the reevaluation entity as there are patient's reevaluation.

The description of the reevaluation entity is in the “**reevaluation entity**” section

<b>anamnesis</b>	String	OPTIONAL
------------------	--------	----------

Patient's medical history information. The taking of a patient's personal medical history

Format: Alphanumeric string up to 400 characters.

<b>homeBasedTherapy</b>	String	OPTIONAL
-------------------------	--------	----------

Patient's home-based therapy.

Format: Alphanumeric string up to 400 characters.

<b>medicalVisitList</b>	List	OPTIONAL
-------------------------	------	----------

List of patient's medical visits.

Filled with as many elements of the medicalVisit entity as there are patient visits.

The medicalVisit entity is described in the “**medicalVisit entity**” section.

<b>nursingCareStart</b>	String	OPTIONAL
-------------------------	--------	----------

Date and time of the start of nursing care for the patient

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>imagingTestList</b>	List	OPTIONAL
------------------------	------	----------

List of patient's imaging tests.

Filled with as many elements of the imaging test entity as there are imaging test.

The description of the imagingTest entity is in the " **imagingTest entity**” section.

<b>labTestList</b>	List	OPTIONAL
--------------------	------	----------

List of patient's lab tests.

Filled with as many labTest entity elements as the patient's lab tests.

The description of the labTest entity is in the " **labTest entity**” section.

<b>otherTestList</b>	List	OPTIONAL
----------------------	------	----------

List of patient's other tests.

Filled with as many elements of the otherTest entity as there are patient's other tests.

The description of the otherTest entity is in the " **otherTest entity**” section.

<b>vitalParametersList</b>	List	OPTIONAL
----------------------------	------	----------

List of patient vital signs.

Filled with as many elements of the "vitalParameter entity” as there are patient's vital parameters.

The description of the vital parameter entity is in the "**vitalParameters entity**" section.

---

<b>nursingCareNotesList</b>	List	OPTIONAL
-----------------------------	------	----------

---

List of nursing care of the patient.

The description of the nursingCareNote entity is in the "**nursingCareNote entity**" section.

Filled with as many elements of the nursingCareNote entity as there are patient's nursing care notes.

---

<b>clinicalDiaryList</b>	List	OPTIONAL
--------------------------	------	----------

---

Information regarding the patient's clinical diary

The entity clinicalDiary is described in the "**clinicalDiary entity**" section.

---

<b>medicalProceduresList</b>	List	OPTIONAL
------------------------------	------	----------

---

List of medical procedures (specific surgical, medical, or diagnostic interventions) in ED

Filled with as many elements of the medicalProcedure entity as there are patient's medical procedures performed in ED.

The description of the medicalProcedure entity is in the "**medicalProcedure entity**" section.

---

<b>specialistConsultancyList</b>	List	OPTIONAL
----------------------------------	------	----------

---

List of patient's specialist consultancy.

Filled with as many elements of the "specialistConsultancy" entity as there are patient's specialist consultancy.

The description of the specialistConsultancy entity is in the "**specialistConsultancy entity**" section.

---

<b>pharmaceuticalTherapyList</b>	List	OPTIONAL
----------------------------------	------	----------

---

List of pharmaceutical therapy prescription and administration.

Filled with as many elements of the "pharmaceuticalTherapy" entity as there are patient's pharmaceutical therapy.

The description of the pharmaceutical therapy entity is in the "**pharmaceuticalTherapy entity**" section.

---

<b>respiratorySupportList</b>	List	OPTIONAL
-------------------------------	------	----------

---

List of respiratory support.

Filled with as many elements of the "respiratorySupport" entity as there are patient's respiratory support. The description of the respiratorySupport entity is in the "**respiratorySupport entity**" section.

---

<b>monitoringList</b>	List	OPTIONAL
-----------------------	------	----------

---

List of monitoring.

Filled with as many elements of the "monitoring" entity as there are patient's respiratory support.

The description of the monitoring entity is in the "**monitoring entity**" section.

---

<b>discharge</b>	discharge	OPTIONAL
------------------	-----------	----------

---

Information related to discharge.

The discharge entity is described in the discharge section.

---

<b>obsUnit</b>	obsUnit	OPTIONAL
----------------	---------	----------

---

Set of information relating to the patient's presence in the Observation Unit

The obsUnit entity is described in the obsUnit section.

## 5. Dependent entities edEpisode

It is specified that the mandatory nature of entity fields is defined in this way:

**Mandatory Field:** Indicates whether the field is mandatory, optional, or conditionally mandatory. Specifically:

- **MANDATORY:** Field whose value is always required, failing which the data will not be validated.
- **OPTIONAL:** Field whose value is not mandatory, but it is recommended to fill it whenever the data is present in the source application (e.g., 'DecisionObsUnit' is optional since not all cases in the Emergency Room result in decision towards ObsUnit, but it is recommended to populate it for all cases that reach ObsUnit).
- **CONDITIONALLY MANDATORY:** Field whose value is mandatory under specific conditions, as indicated in the field's definition.

### episode entity

The {**episode**} entity represents all the information of the episode. The entity is described using the following JSON object:

```
{
  "organizationCode": "32987"
  "emergencyDepartmentId": "123556"
  "episodeId": "2024123455",
  "edArrivalDateTime": "2022-06-22T15:13:23",
  "sex": "1",
  "age": "35",
  "arrivalModeCode": "2"
}
```

where:

<b>organizationCode</b>	String	MANDATORY
Unique numeric identification code that is used to identify a hospital within health care and administrative systems.		
Format: Alphanumeric string, maximum length: 20 characters.		
<b>emergencyDepartmentId</b>	String	MANDATORY
Identification of ED (general, obstetrics, ophthalmology....).		
Format: Alphanumeric string, maximum length: 20 characters.		
<b>episodeId</b>	String	MANDATORY
Identification ED patient's admission		
Format: Alphanumeric string, maximum length: 20 characters.		
<b>edArrivalDateTime</b>	String	OPTIONAL
Date and time of arrival to the emergency room.		
Date format: "YYYY-MM-DDTHH:mm:ss"		
<b>sex</b>	String	OPTIONAL
Gender of the patient.		
Allowed values: 1 for Male, 2 for Female, 9 for Not Specified		
<b>Age</b>	String	OPTIONAL

The age in years of the patient.

<b>arrivalModeCode</b>	String	OPTIONAL
How the patient arrived at the ED: e.g. by ambulance dispatched by pre-hospital emergency service (EMS), by helicopter dispatched by EMS, transferred from an ED of another Hospital, Self-presented/by their own means		
E.r.: 1: Ambulance from 112, 2: Ambulance from another hospital, 3: Autonomous (by own means), 4: Other (fire department, military ambulance, etc.), 5: Not known.		
The Hospital has to provide a table containing the description of each code.		

### triage entity

The {**triage**} entity represents the triage event of a patient in the ER and is described using the following JSON object:

```
{
  "triageDateTime": "2023-06-22T15:12:45",
  "triagePriority": "3",
  "triageNotes": "Patient presented with severe chest pain and difficulty breathing. History of heart disease.",
  "mainClinicalProblem": "14",
  "secondaryClinicalProblem": "Acute neurological syndrome, Other nervous system symptoms"
}
```

Where:

<b>triageDateTime</b>	String	OPTIONAL
Date and time of triage.		
Date format: "YYYY-MM-DDTHH:mm:ss"		
<b>triagePriority</b>	String	OPTIONAL
Priority level code assigned to the patient.		
E.g.: Code : 1,2,3,4,5,6, X (Not performed)		
The Hospital has to provide a table containing the description of each code.		
<b>triageNotes</b>	String	OPTIONAL
The field contains triage notes including medications and drugs taken at home, allergies, known pathologies collected at triage, description of events at triage, clinical examination, etc.		
Format: Alphanumeric string up to 400 characters		
<b>mainClinicalProblem</b>	String	OPTIONAL
Main clinical problem and symptoms detected during the triage evaluation.		
E.g.: 1 - Coma, 2 - Acute neurological syndrome, 3 - Other nervous system symptoms, 4 - Abdominal pain, 5 - Chest pain, 6 - Dyspnoea, etc.		
The Hospital has to provide a table containing the description of each code.		
<b>secondaryClinicalProblem</b>	String	OPTIONAL
Description of Secondary clinical problem and symptoms detected during the triage evaluation.		
Concatenation of secondary problems into a string		

### pathAssignment entity

The {**pathAssignment**} entity represents the set of information relating to path assignment in the ED and is described through the following JSON object:

```
{
  "idObject": "123",
  "edPathAssignmentDateTime": "2022-06-22T15:13:23",
  "pathCode": "1"
}
```

Filled with as many elements of the pathAssignment entity as there are pathAssignment.

<b>idObject</b>	String	OPTIONAL
An identifier of an object that can have multiplicity and that uniquely identifies it.		
<b>edPathAssignmentDateTime</b>	String	OPTIONAL
Date and hour of the path assignment of the patient		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>pathCode</b>	String	OPTIONAL
ED path identification code.		

E.g.: 1. High complexity area; 2. Low complexity area; 3. Paediatric fast-track; 4. Ophthalmologic fast-track

### reevaluation entity

The {**reevaluation**} entity represents the **reevaluation** of the priority level and is described using the following JSON object:

```
{
  "idObject": "123",
  "reevaluationTime": "2022-06-22T15:13:23",
  "newPriorityLevel": "2"
}
```

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of an object that can have multiplicity and that uniquely identifies it.		
<b>reevaluationTime</b>	String	OPTIONAL
Date and hour of the reevaluation of the patient's triage/priority level		
Date format: "YYYY-MM-DDTHH:mm:ss"		
<b>newPriorityLevel</b>	String	OPTIONAL
New priority level code assigned to the patient		

E.g.: Code: 1,2,3,4,5,6, X (Not performed)

The Hospital has to provide a table containing the description of each code.

### medicalVisit entity

The entity {**medicalVisit**} represents the information of the medical visit of a patient in the emergency room and is described using the following JSON object:

```
{
  "idObject": "123",
  "dateTimeMedicalVisit": "2022-06-22T15:13:23",
  "medicalVisitOutcome": "The patient presented with persistent abdominal pain and nausea. Physical examination revealed tenderness in the right lower quadrant. Laboratory tests ordered for complete blood count and abdominal ultrasound scheduled for further evaluation. Prescribed pain medication and advised on dietary modifications. Follow-up appointment scheduled in one week."
}
```

List of patient's medical visits. Filled with as many elements of the medicalVisit entity as there are patient's visits.

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of an object that can have multiplicity and that uniquely identifies it.		
<b>dateTimeMedicalVisit</b>	String	OPTIONAL
Date and time of doctor's taking on of the patient: Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>medicalVisitOutcome</b>	String	OPTIONAL
Field filled with the outcome of the visit.  Format: Alphanumeric string up to 2000 characters.		

### imagingTest entity

The {**imagingTest**} entity represents the set of information relating to imaging tests in ED and is described through the following JSON object:

#### Case A:

```
{
  "requestId": "32987_2024123455_122359",
  "idObject": "123",
  "dateTimeRequestImagingTest": "2023-06-22T15:13:02",
  "dateTimeImagingTestExecution": "2023-06-22T15:13:21",
  "dateTimeImagingTestReport": "2023-06-22T15:13:35",
  "imagingTestCode": "77723",
  "imagingTestReportText": "Clear lung fields with no signs of consolidation or infiltrates. No evidence of fractures or abnormalities. Normal cardiac silhouette."
}
```

#### Case B:

```
{
  "requestId": "32987_2024123455_122359"
  "idObject": "123"
}
```

In case B, the data are extracted from the RIS system and described in the “RIS imagingTest Entity”

Filled with as many elements of the imagingTest entity as there are imaging tests.

The following test imaging reports must be extracted:

- If Dyspnoea: US, Head/neck CT, Chest CT, Chest Rx,
- if TLoC: Brain CT scan, Brain MRI, US cardiac, Chest CT scan, Pulmonary scintigraphy, Gastroscopy, Abdomen CT scan

Where:

<b>requestId</b>	String	MANDATORY
Field constructed from the concatenation between the Organization Code, ED event (episodeld) and the request number. The request number is generated by the ED system when the exam is requested (booked) on an external system (RIS, LIS; other EHR). It is a unique value.		

Format: Alphanumeric string up to 40 characters.

<b>idObject</b>	String	OPTIONAL
An identifier of a child object that uniquely identifies it in the request		

<b>dateTimeRequestImagingTest</b>	String	OPTIONAL
Date and time of the request for imaging the test.		
Date format: "YYYY-MM-DDTHH:mm:ss".		

<b>dateTimeImagingTestExecution</b>	String	OPTIONAL
Date and time of the execution of the imaging test.		
Date format: "YYYY-MM-DDTHH:mm:ss".		

<b>dateTimeImagingTestReport</b>	String	OPTIONAL
Date and time of the imaging test report		
Date format: "YYYY-MM-DDTHH:mm:ss".		

<b>imagingTestCode</b>	String	OPTIONAL
Code of the imaging test		
Format: Alphanumeric string up to 400 characters.		

The Hospital has to provide a table containing the description of each code.

<b>imagingTestReportText</b>	String	OPTIONAL
Text filled reporting the results of the imaging tests (radiology, etc.).		
Format: Alphanumeric string up to 2000 characters.		

### labTest entity

The {labTest} entity represents the set of information relating to laboratory tests in the ED and is described through the following JSON object:

Case A:

```
{
  "requestId": "39876_2024123455_122346",
  "idObject": "3457",
  "labTestCode": "A32",
```

```

    "labTestDescription": "glucose",
    "dateTimeLabTestRequest": "2022-06-22T15:13:23",
    "dateTimeLabTestExecution": "2022-06-22T15:13:23",
    "labTestResults": 123,
    "unitOfMeasureLabTest": mg/dL
  }

```

**Case B:**

```

{
  "requestId": "39876_2024123455_122346"
  "idObject": "3457",
}

```

In case B, the data are extracted from the LIS system and described in the "LAB labTest Entity"

Filled with as many elements of the labTest entity as there are laboratory tests.

The following examinations and results must be extracted:

If Dyspnea: pH, PaO<sub>2</sub>, PaCO<sub>2</sub>, HCO<sub>3</sub>, Lactates, Hemoglobin, Platelets, Leukocytes, CReactiveProtein, bloodGlucose, bloodSodium, bloodPotatium, Creatinine, Transaminases, INR, Troponin, BNP, DDimer, SARSCoV2swabTest

if TLoC: Lactates, Hemoglobin, Platelets, Leukocytes, CReactiveProtein, bloodGlucose, bloodSodium, bloodPotatium, bloodCalcium, Creatinine, Transaminases, INR, Troponin, BNP, DDimer, CreatineKinase, BloodAlcohol, BloodDrug, UrineDrug

Where:

<b>requestId</b>	String	MANDATORY
Field constructed from the concatenation between the Organization Code, ED event (episodeld) and the request number. The request number is generated by the ED system when the exam is requested (booked) on an external system (RIS, LIS; other EHR). It is a unique value.		

Format: Alphanumeric string up to 40 characters.

<b>idObject</b>	String	OPTIONAL
An identifier of a child object that uniquely identifies it in the request		

<b>labTestCode</b>	String	OPTIONAL
Code of the LabTest.		

Format: Alphanumeric string up to 400 characters.

The Hospital has to provide a table containing the description of each code.

<b>labTestDescription</b>	String	OPTIONAL
Description of the LabTest.		

<b>dateTimeLabTestRequest</b>	String	OPTIONAL
Date and time of the request for the lab test		

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>dateTimeLabTestExecution</b>	String	OPTIONAL
Date and time of the lab test execution		

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>labTestResults</b>	String	OPTIONAL
Result of the lab test. Format: Alphanumeric string up to 20 characters.		
<b>unitOfMeasure</b>	String	OPTIONAL
Unit of measure for the result. If the numeric result exists, the unit of measure is mandatory.		

### otherTest entity

The {otherTestList} entity represents the set of information relating to other tests in the ED and is described through the following JSON object:

#### Case A:

```
{
  "requestId": "39876_2024123455_122333356",
  "idObject": "3457",
  "dateTimeRequestOtherTest": "2022-06-22T15:13:23",
  "dateTimeOtherTestExecution": "2022-06-22T15:14:23",
  "dateTimeOtherTestReport": "2022-06-22T15:15:23",
  "otherTestCode": "532"
  "otherTestReportText": "ECG waveform within normal limits"
}
```

#### Case B:

```
{
  "requestId": "39876_2024123455_122333356",
  "idObject": "3457"
}
```

In case B, the data are extracted from the other EHR system and described in the “Other otherTest Entity”

Filled with as many elements of the otherTest entity as there are other tests.

Where:

<b>requestId</b>	String	MANDATORY
Field constructed from the concatenation between the Organization Code, ED event (episodeID) and the request number. The request number is generated by the ED system when the exam is requested (booked) on an external system (RIS, LIS; other EHR). It is a unique value.		
<b>idObject</b>	String	OPTIONAL
An identifier of a child object that uniquely identifies it in the request		
<b>dateTimeRequestOtherTest</b>	String	OPTIONAL
Date and time of the request other test  Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeOtherTestExecution</b>	String	OPTIONAL
Date and time of the other test execution  Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeOtherTestReport</b>	String	OPTIONAL

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>otherTestCode</b>	String	OPTIONAL
Code of the other test		
Format: Alphanumeric string up to 400 characters.		
The Hospital has to provide a table containing the description of each code.		
<b>otherTestReportText</b>	String	OPTIONAL
Field filled reporting the results of the test (ECG, EEG, gastroscopy etc.).		
Format: Alphanumeric string up to 2000 characters.		

The `{vitalParameter}` entity is the set of vital parameters collected during triage in the Emergency Department and is described through the following JSON object:

```
{
  "idObject": "123",
  "dateTimeDetection": "2022-06-22T15:13:23",
  "systolicPressure": "120",
  "diastolicPressure": "60",
  "heartRate": "95",
  "respiratoryRate": "14",
  "bodyTemperature": "38",
  "spO2": "95",
  "levelConsciousness": "2",
  "vitalParametersText": "- Heart Rate: 98 bpm\n\t\t\t\t- Respiratory Rate:
20."
}
```

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of an object that can have multiplicity and that uniquely identifies it.		
<b>dateTimeDetection</b>	String	OPTIONAL
Vital signs monitoring star date and hour		
Date format: "YYYY-MM-DDTHH:mm:ss"		
<b>systolicPressure</b>	String	OPTIONAL
Systolic pressure in triage.		
String value from 0 to 3 digits, unit of measure mmHg.		
<b>diastolicPressure</b>	String	OPTIONAL
Diastolic pressure in triage.		
String value from 0 to 3 digits, unit of measure mmHg.		
<b>heartRate</b>	String	OPTIONAL

Heart rate in triage.

String value from 0 to 3 digits, unit of measure Bpm

<b>respiratoryRate</b>	String	OPTIONAL
Respiratory rate in triage. String value from 0 to 2 digits, unit of measure breaths/minute.		
<b>bodyTemperature</b>	String	OPTIONAL
Body temperature in triage. String value (2 digits, 1 digit after the separator) unit of measure degrees Celsius		
<b>spO2</b>	String	OPTIONAL
Oxygen saturation detected at triage  String value from 0 to 2 digits, unit of measure breaths/minute.		
<b>levelConsciousness</b>	String	OPTIONAL
The AVPU scale (Alert, Voice, Pain, Unresponsive) to measure and record the patient's level of consciousness (4 levels: AVPU). Allowed values: 1 – Alert, 2 – Voice, 3 – Pain, 4 - Unresponsive		
<b>vitalParametersText</b>	String	OPTIONAL
Field used alternatively or in addition to compiling structured data. Contains list of vital signs or clinical examination.  Format: Alphanumeric string up to 400 characters.		

### nursingCareNote entity

The entity {**nursingCareNote**} represents the set of information of the nursing operations and registrations and is described through the following JSON object:

```
{
  "idObject": "123",
  "dateTimeNote": "2022-06-22T15:13:23",
  "nursingNote": "Patient received prompt percutaneous coronary intervention (PPCI) for acute myocardial infarction. Vital signs monitored closely for the first 6 hours post-procedure. No complications observed. Patient remained stable and comfortable. Provided education on post-PPCI care and scheduled follow-up appointments."
}
```

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of an object that can have multiplicity and that uniquely identifies it.		
<b>dateTimeNote</b>	String	OPTIONAL
Date and time of the note. Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>nursingNote</b>	String	OPTIONAL
Field filled with nursing notes. Format: Alphanumeric string up to 2000 characters.		

### clinicalDiary entity

The entity {**clinicalDiary**} represents the information of the clinical diary of a patient in ED and is described using the following JSON object:

```
{
  "idObject": "123",
  "dateTimeClinicalDiary": "2022-06-22T15:13:23",
  "clinicalDiary": "Patient admitted with a history of chronic obstructive pulmonary disease (COPD) exacerbation. Received nebulized bronchodilators and systemic corticosteroids. Respiratory distress improved over the next 24 hours. Continued close monitoring of oxygen saturation and respiratory rate. Introduced physiotherapy sessions for airway clearance. Patient responding well to treatment. Daily assessments scheduled to track progress."
}
```

List of patient's clinical diary.

Filled with as many elements of the clinicalDiaryList entity as there are patient's clinical diary.

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of an object that can have multiplicity and that uniquely identifies it.		
<b>dateTimeClinicalDiary</b>	String	OPTIONAL
Date and time of the note: Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>clinicalDiary</b>	String	OPTIONAL
Information that contains clinical care data and treatment  Format: Alphanumeric string up to 2000 characters.		

### 2.1 medicalProcedure entity

The entity {**medicalProcedure**} represents the information of the medical procedures of a patient in ED and is described using the following JSON object:

```
{
  "idObject": "123",
  "dateTimeRequestMedicalProcedure": "2022-06-22T15:13:23",
  "dateTimeExecutionMedicalProcedure": "2022-06-22T15:13:23",
  "medicalProcedureCode": "318"
}
```

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of an object that can have multiplicity and that uniquely identifies it.		
<b>dateTimeRequestMedicalProcedure</b>	String	OPTIONAL
Date and time of the medical procedure request  Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeExecutionMedicalProcedure</b>	String	OPTIONAL

Date and time of the medical procedure execution

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>medicalProcedureCode</b>	String	OPTIONAL
Code of the medical procedure		

Format: Alphanumeric string up to 400 characters.

The Hospital has to provide a table containing the description of each code.

## 2.2 **specialistConsultancy** entity

The {**specialistConsultancy**} entity represents consultations performed in ED and is described using the following JSON object:

Case A:

```
{
  "requestId": "32987_2024123455_3556",
  "idObject": "3457",
  "consultancyType": "Cardiology Consultation",
  "dateTimeSpecialistConsultancy": "2023-06-22T15:14:18",
  "reportTextSpecialistConsultancy": "The patient with a history of
hypertension and chest pain underwent a thorough cardiac evaluation. ECG and
echocardiogram performed, revealing no significant abnormalities. Recommended
lifestyle modifications, continued antihypertensive medication, and scheduled a
follow-up visit in three months."
}
```

Case B:

```
{
  "requestId": "32987_2024123455_3556",
  "idObject": "3457"
}
```

In case B, the data are extracted from the other EHR system and described in the "External specialistConsultancy Entity"

Filled with as many consultations as there are consultations performed.

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of an object that can have multiplicity and that uniquely identifies it.		

<b>requestId</b>	String	MANDATORY
Field constructed from the concatenation between the Organization Code, ED event (episodeID) and the request number. The request number is generated by the ED system when the exam is requested (booked) on an external system (RIS, LIS; other EHR). It is a unique value.		

Format: Alphanumeric string up to 40 characters.

<b>consultancyType</b>	String	OPTIONAL
Contains the type of consultancy requested.		

Format: Alphanumeric string up to 50 characters.

<b>dateTimeSpecialistConsultancy</b>	String	OPTIONAL

Date and time of patient specialist consultancy

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>reportTextSpecialistConsultancy</b>	String	OPTIONAL
--	--------	----------

Filled in field reporting the outcome of the specialist consultancy.

Format: Alphanumeric string up to 2000 characters.

### pharmaceuticalTherapy entity

The {**pharmaceuticalTherapy**} entity represents the pharmaceutical therapy prescription and administration performed in ED and is described using the following JSON object:

```
{
  "idObject": "123",
  "dateTimeTherapyPrescription": "2022-06-22T15:13:23",
  "dateTimeTherapyAdministration": "2022-06-22T15:13:23",
  "therapyType": "34563"
}
```

where:

<b>idObject</b>	String	OPTIONAL
-----------------	--------	----------

An identifier of an object that can have multiplicity and that uniquely identifies it.

<b>dateTimeTherapyPrescription</b>	String	OPTIONAL
------------------------------------	--------	----------

Pharmaceutical therapy administration - date and hour

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>dateTimeTherapyAdministration</b>	String	OPTIONAL
--------------------------------------	--------	----------

Pharmaceutical therapy administration - date and hour

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>therapyType</b>	String	OPTIONAL
--------------------	--------	----------

Type of therapy administered.

Format: Alphanumeric string up to 200 characters.

### respiratorySupport entity

The {**respiratorySupport**} entity represents the filled field with date and time of start and end of respiratory support in ED and is described using the following JSON object:

```
{
  "startTimeRespiratorySupport": "2022-06-22T15:13:23",
  "endTimeRespiratorySupport": "2022-06-22T15:13:23"
}
```

where:

<b>startTimeRespiratorySupport</b>	String	OPTIONAL
------------------------------------	--------	----------

Respiratory support start date and hour

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>endTimeRespiratorySupport</b>	String	OPTIONAL
----------------------------------	--------	----------

Respiratory support end date and hour

Date format: "YYYY-MM-DDTHH:mm:ss".

### monitoring entity

The {**monitoring**} entity represents the filled field with date and time of start and end of monitoring support in ED and is described using the following JSON object:

```
{
  "startTimeMonitoring": "2022-06-22T15:13:23",
  "endTimeMonitoring": "2022-06-22T15:13:23"
}
```

Dove:

start <del>Time</del> Monitoring	String	OPTIONAL
----------------------------------	--------	----------

Monitoring start date and hour

Date format: "YYYY-MM-DDTHH:mm:ss".

end <del>Time</del> Monitoring	String	OPTIONAL
--------------------------------	--------	----------

Monitoring end date and hour

Date format: "YYYY-MM-DDTHH:mm:ss".

### discharge entity

The {**discharge**} entity represents the discharge and is described using the following JSON object:

```
{
  "dischargeDecisionDateTime": "2022-06-22T15:13:23",
  "dischargeDateTime": "2022-06-22T15:13:23",
  "modeOfExit": "3",
  "diagnosisAtEDDischarge": "OTHER CHEST PAIN",
  "dischargeNotes": "The patient presented with symptoms of pneumonia and received appropriate treatment during their hospital stay. Clinical condition has significantly improved, and vital signs are stable. The patient is discharged home with a prescription for antibiotics, analgesics, and instructions for continued care. Advised to follow up with the primary care physician in one week for further evaluation and monitoring. Provided education on signs and symptoms warranting immediate medical attention. Patient and family informed and engaged in the discharge plan."
}
```

where:

dischargeDecisionDateTime	String	OPTIONAL
---------------------------	--------	----------

Date and time of the decision to admit/transfer to another hospital/discharge, if the patient has to wait for a bed or a transfer to another hospital (boarding).

Date format: "YYYY-MM-DDTHH:mm:ss".

dischargeDateTime	String	OPTIONAL
-------------------	--------	----------

Date and time of patient discharge from the ER.

Date format: "YYYY-MM-DDTHH:mm:ss".

modeOfExit	String	OPTIONAL
------------	--------	----------

Mode of exit.

Allowed values: 1- if admitted, 2 - if transferred, 3 - if decease,4 - if voluntary abandonment.

diagnosisAtEDDischarge	String	OPTIONAL
------------------------	--------	----------

Diagnosis at the end of hospitalisation

Format: Alphanumeric string up to 2000 characters.

<b>dischargeNotes</b>	String	OPTIONAL
Field filled with discharge notes, included clinical ED Outcome, ED Discharge Care Plan, ED Discharging Pharmacological Therapy and clinical Condition at Discharge		

Format: Alphanumeric string up to 2000 characters.

### obsUnit entity

The {obsUnit} entity represents the set of information about the patient's presence in the OBSUNIT and is described using the following JSON object:

```
{
  "decisionObsUnit": "2022-06-22T15:13:23",
  "transferObsUnit": "2022-06-22T15:13:23",
  "exitObsUnit": "2022-06-22T15:13:23"
}
```

Where:

<b>decisionObsUnit</b>	String	OPTIONAL
Date and time of decision to Short Stay Observation Unit		
Format: "YYYY-MM-DDTHH:mm:ss".		
<b>transferObsUnit</b>	String	OPTIONAL
Date and time of transfer to Observation Unit		
Format: "YYYY-MM-DDTHH:mm:ss".		
<b>exitObsUnit</b>	String	OPTIONAL
Date and time of exit to Observation Unit		
Format: "YYYY-MM-DDTHH:mm:ss".		

## 6. RIS imagingTest Entity

The {imagingTest} entity represents the set of information relating to imaging tests in RIS and requested by ED and is described through the following JSON object:

```
{
  "requestId": "32987_024123455_122359",
  "idObject": "3457",
  "dateTimeRequestImagingTest": "2022-06-22T15:13:23",
  "dateTimeImagingTestExecution": "2022-06-22T15:14:23",
  "dateTimeImagingTestReport": "2022-06-22T15:15:23",
  "imagingTestCode": "78766",
  "imagingTestReportText": "No significant lesions are observed bony lesions
of the skeletal segments under examination; presence of slight liquid
stratum intra-articular coxofemoral on both sides."
}
```

Filled with as many elements of the imagingTest entity as there are imaging tests.

Where:

<b>requestId</b>	String	MANDATORY
Field constructed from the concatenation between the Organization Code, ED event (episodeld) and the request number. The request number is generated by the RIS system when the exam is accepted. It is a unique value.		
Alphanumeric string, maximum length: 40 characters.		
<b>idObject</b>	String	OPTIONAL
An identifier of a child object that uniquely identifies it in the request		
<b>dateTimeRequestImagingTest</b>	String	OPTIONAL
Date and time of the request for imaging the test.		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeImagingTestExecution</b>	String	OPTIONAL
Date and time of the execution of the imaging test.		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeImagingTestReport</b>	String	OPTIONAL
Date and time of the imaging test report		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>imagingTestCode</b>	String	OPTIONAL
Code of the imaging test		
Format: Alphanumeric string up to 40 characters.		
The Hospital has to provide a table containing the description of each code.		
<b>imagingTestReportText</b>	String	OPTIONAL
Filed filled reporting the results of the imaging tests (radiology, etc.).		
Format: Alphanumeric string up to 2000 characters.		

## 7. External specialistConsultancy Entity

The {specialistConsultancy} entity represents the set of information relating to specialist Consultancy in other EHR and requested by ED and is described through the following JSON object:

```
{
  "requestId": "32987_2024123455_3556",
  "idObject": "3457",
  "consultancyType": "Cardiology Consultation",
  "dateTimeSpecialistConsultancy": "2023-06-22T15:14:18",
  "reportTextSpecialistConsultancy": "The patient with a history of
  hypertension and chest pain underwent a thorough cardiac evaluation. ECG and
  echocardiogram performed, revealing no significant abnormalities. Recommended
  lifestyle modifications, continued antihypertensive medication, and scheduled a
  follow-up visit in three months."
}
```

Filled with as many consultations as there are consultations performed.

Where:

<b>requestId</b>	String	MANDATORY
Field constructed from the concatenation between the Organization Code, ED event (episodeld) and the request number. The request number is generated by the ED system when the exam is requested (booked) on an external system (RIS, LIS; other EHR). It is a unique value.		
<b>idObject</b>	String	OPTIONAL
An identifier of a child object that uniquely identifies it in the request		
<b>consultancyType</b>	String	OPTIONAL
This field contains the type of consultancy requested.		
It is a unique value.		
Format: Alphanumeric string up to 50 characters.		
<b>dateTimeSpecialistConsultancy</b>	String	OPTIONAL
Date and time of patient specialist consultancy		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>reportTextSpecialistConsultancy</b>	String	OPTIONAL
Field filled reporting the outcome of the specialist consultancy.		
Format: Alphanumeric string up to 2000 characters.		

## 8. Other otherTest Entity

The {otherTest} entity represents the set of information relating to other tests in other EHR and requested by ED and is described through the following JSON object:

```
{
  "requestId": "32987_2024123455_452346",
  "idObject": "3457",
  "dateTimeRequestOtherTest": "2022-06-22T15:13:23",
  "dateTimeOtherTestExecution": "2022-06-22T15:14:23",
  "dateTimeOtherTestReport": "2022-06-22T15:15:23",
  "otherTestCode": "532",
  "otherTestReportText": "ECG waveform within normal limits"
}
```

Where:

<b>requestId</b>	String	MANDATORY
Field constructed from the concatenation between the Organization Code, ED event (episodeID) and the request number. The request number is generated by the ED system when the exam is requested (booked) on an external system (RIS, LIS; other EHR). It is a unique value.		
<b>idObject</b>	String	OPTIONAL
An identifier of a child object that uniquely identifies it in the request		
<b>dateTimeRequestOtherTest</b>	String	OPTIONAL
Date and time of the request other test		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeOtherTestExecution</b>	String	OPTIONAL
Date and time of the other test execution		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeOtherTestReport</b>	String	OPTIONAL
Date and time of the other test report		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>otherTestCode</b>	String	OPTIONAL
Code of the other test		
Format: Alphanumeric string up to 400 characters.		
The Hospital has to provide a table containing the description of each code.		
<b>otherTestReportText</b>	String	OPTIONAL
Field filled reporting the results of the other tests (ECG, EEG, gastroscopy etc.).		
Format: Alphanumeric string up to 2000 characters.		

## 9. LAB labTest Entity

The {labTest} entity represents the set of information relating to laboratory tests In LIS and requested by ED and is described through the following JSON object:

```
{
```

```

    "requestId": "32987_2024123455_122346",
    "idObject": "3457",
    "labTestCode": "b168_14",
    "labTestDescription": "potb",
    "dateTimeLabTestRequest": "2023-06-22T15:13:12",
    "dateTimeLabTestExecution": "2023-06-22T15:13:25",
    "labTextResults": "100",
    "unitOfMeasureLabText": "mmol/L"
  }

```

Filled with as many elements of the labTestList entity as there are laboratory tests.

The following examinations and results must be extracted:

- If Dyspnea:

SpO2, pH, PaO2, PaCO2, HCO3, Lactates, Hemoglobin, Plateletsn, Leukocytes, CReactiveProtein, bloodGlucose, bloodSodium, bloodPotatium, Creatinine, Transaminases, INR, Troponin, BNP, DDimer, SARSCoV2swabTest

- if TLoC:

Lactates, Hemoglobin, Platelets, Leukocytes, CReactiveProtein, bloodGlucose, bloodSodium, bloodPotatium, bloodCalcium, Creatinine, Transaminases, INR, Troponin, BNP, DDimer, CreatineKinase, BloodAlcohol, BloodDrug, UrineDrug

Where:

requestId	String	MANDATORY
Field constructed from the concatenation between the Organization Code, ED event (episodeld) and the request number. The request number is generated by the LIS system when the exam is accepted. It is a unique value.		

Format: alphanumeric string, maximum length: 20 characters.

idObject	String	OPTIONAL
An identifier of a child object that uniquely identifies it in the request		

labTestCode	String	OPTIONAL
Code of the LabTest.		

Format: Alphanumeric string up to 400 characters.

The Hospital has to provide a table containing the description of each code.

labTestDescription	String	OPTIONAL
Description of the LabTest.		

dateTimeLabTestRequest	String	OPTIONAL
Date and time of the request for the lab test		

Date format: "YYYY-MM-DDTHH:mm:ss".

dateTimeLabTestExecution	String	OPTIONAL
Date and time of the lab test execution		

Date format: "YYYY-MM-DDTHH:mm:ss".

labTestResults	String	OPTIONAL
----------------	--------	----------

Numeric result of the lab test.

Decimal format 5 Strings and 3 decimals

---

<b>unitOfMeasure</b>	String	OPTIONAL
----------------------	--------	----------

Unit of measure for the result.

If the numeric result exists, the unit of measure is mandatory.

---

## 10. useCasesUC2 Entity

The {useCasesUC2} entity is the set of data to be managed for UC1 of the eCREAM project and is described through the following JSON object:

```
{
  "episode": {episode},
  "triage": {triage},
  "pathAssignmentList": [{pathAssignment}],
  "turnaroundTime": "2022-06-22T15:13:23",
  "revaluationList": [{revaluation}],
  "imagingTestList": [{imagingTest}],
  "labTestList": [{labTest}],
  "otherTestList": [{otherTest}],
  "vitalParametersList": [{vitalParameter}],
  "nursingCareNotesList": [{nursingCareNote}],
  "medicalVisitList": [{medicalVisit}],
  "clinicalDiaryList": [{clinicalDiary}],
  "medicalProcedureList": [{medicalProcedure}],
  "specialistConsultancyList": [{specialistConsultancy}],
  "pharmaceuticalTherapyList": [{pharmaceuticalTherapy}],
  "respiratorySupportList": [{respiratorySupport}],
  "monitoringList": [{monitoring}],
  "discharge": {discharge},
  "obsUnit": {obsUnit}
}
```

Where:

<b>episode</b>	episode	MANDATORY
Patient access in ED. The description of the episode entity is in the “ <b>episode entity</b> ” section		
<b>triage</b>	triage	OPTIONAL
Patient triage information. The description of the triage entity is in the “ <b>triage entity</b> ” section		
<b>pathAssignmentList</b>	List	OPTIONAL
List of path assignement of the patient's.		

Filled with as many elements of the pathAssignment entity as the path assignement. If, for example, a patient first referred to an Ophthalmic Fast-Track pathway and later referred to the Low Complexity Area pathway, there must be two elements of the assignment pathway PS entity-one for the Ophthalmic Fast-Track and the other for the Low Complexity Area pathway

The description of the pathAssignement entity is in the “**pathAssignement entity**” section,

<b>turnaroundTime</b>	String	OPTIONAL
The turnaround time (the time taken for ambulance crew to handover the patient and restock the vehicle, so it is ready to attend another call) is taken from the time of arrival of the ambulance at the receiving hospital to the time the ambulance “clears” becomes available. This includes the time taken to wait to handover a patient to the care of the hospital staff plus any additional time they spend at hospital.		

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>revaluationList</b>	List	OPTIONAL
List of revaluation of the patient's triage/priority level		

Filled with as many elements of the revaluation entity as there are patient's revaluation.

The description of the revaluation entity is in the “**revaluation entity**” section

<b>imagingTestList</b>	List	OPTIONAL
List of patient's imaging tests.		
Filled with as many elements of the imaging test entity as there are imaging tests.		
The description of the imagingTest entity is in the " <b>imagingTest entity</b> " section.		
<b>labTestList</b>	List	OPTIONAL
List of patient's lab tests.		
Filled with as many elements of the labTest entity as there are patient's lab tests.		
The description of the labTest entity is in the " <b>labTest entity</b> " section.		
<b>otherTestList</b>	List	OPTIONAL
List of patient's other tests.		
Filled with as many elements of the otherTest entity as there are patient's other tests.		
The description of the otherTestList entity is in the " <b>otherTest entity</b> " section.		
<b>vitalParametersList</b>	List	OPTIONAL
List of patient vital signs.		
Filled with as many elements of the "vitalParameters entity" as there are patient's vital parameters.		
The description of the vital parameter entity is in the " <b>vitalParameter entity</b> " section.		
<b>nursingCareNotesList</b>	List	OPTIONAL
List of nursing care of the patient.		
The description of the nursingCareNote entity is in the " <b>nursingCareNote entity</b> " section.		
Filled with as many elements of the nursingCareNote entity as there are patient's nursing care notes.		
<b>medicalVisitList</b>	List	OPTIONAL
List of patient's medical visits.		
Filled with as many elements of the medicalVisits entity as there are patient visits.		
The medicalVisit entity is described in the "medicalVisit entity" section.		
<b>clinicalDiaryList</b>	List	OPTIONAL
Information regarding the patient's clinical diary		
The entity clinicalDiary is described in the " <b>clinicalDiary entity</b> " section.		
<b>medicalProceduresList</b>	List	OPTIONAL
List of medical procedures (specific surgical, medical, or diagnostic interventions) in ED		
Filled with as many elements of the medicalProcedures entity as there are patient's medical procedures performed in ED.		
The description of the medicalProcedure entity is in the " <b>medicalProcedure entity</b> " section.		
<b>specialistConsultancyList</b>	List	OPTIONAL
List of patient's specialist consultancy.		
Filled with as many elements of the "specialistConsultancy" entity as there are patient's specialist consultancy.		

The description of the specialistConsultancy entity is in the "**specialistConsultancy entity**" section.

<b>pharmaceuticalTherapyList</b>	List	OPTIONAL
List of pharmaceutical therapy prescription and administration.		
Filled with as many elements of the "pharmaceuticalTherapy" entity as there are patient's pharmaceutical therapy.		
The description of the pharmaceutical therapy entity is in the " <b>pharmaceuticalTherapy entity</b> " section.		
<b>respiratorySupportList</b>	List	OPTIONAL
List of respiratory support.		
Filled with as many elements of the "respiratorySupport" entity as there are patient's respiratory support. The description of the respiratorySupport entity is in the "respiratorySupport entity" section.		
<b>monitoringList</b>	List	OPTIONAL
List of monitoring.		
Filled with as many elements of the "monitoring" entity as there are patient's respiratory support.		
The description of the monitoring entity is in the " <b>monitoring entity</b> " section.		
<b>discharge</b>	discharge	OPTIONAL
Information related to discharge.		
The discharge entity is described in the discharge section.		
<b>obsUnit</b>	obsUnit	OPTIONAL
Set of information relating to the patient's presence in the Observation Unit		
The obsUnit entity is described in the obsUnit section.		

## 11. Dependent entities UC2

It is specified that the mandatory nature of entity fields is defined in this way:

**Mandatory Field:** Indicates whether the field is mandatory, optional, or conditionally mandatory. Specifically:

- **MANDATORY:** Field whose value is always required, failing which the data will not be validated.
- **OPTIONAL:** Field whose value is not mandatory, but it is recommended to fill it whenever the data is present in the source application (e.g., 'DecisionObsUnit' is optional since not all cases in the Emergency Room result in decision towards ObsUnit, but it is recommended to populate it for all cases that reach ObsUnit).
- **CONDITIONALLY MANDATORY:** Field whose value is mandatory under specific conditions, as indicated in the field's definition

### episode entity

The {**episode**} entity represents all the information of the episode. The entity is described using the following JSON object:

```
{
  "organizationCode": "32987"
  "emergencyDepartmentId": "generalED"
  "episodeId": "2024123455",
  "edArrivalDateTime": "2022-06-22T15:13:23",
```

```
"sex": "1",
"age": "35",
"arrivalModeCode": "2"
```

```
}
```

where:

<b>organizationCode</b>	String	MANDATORY
Unique numeric identification code that is used to identify a hospital within health care and administrative systems.		
Format: Alphanumeric string, maximum length: 20 characters.		
<b>emergencyDepartmentId</b>	String	MANDATORY
Identification of ED (general, obstetrics, ophthalmology....).		
Format: Alphanumeric string, maximum length: 20 characters.		
<b>episodeId</b>	String	MANDATORY
Identification ED patient's admission		
Format: Alphanumeric string, maximum length: 20 characters.		
<b>edArrivalDateTime</b>	String	OPTIONAL
Date and time of arrival to the emergency room.		
Date format: "YYYY-MM-DDTHH:mm:ss"		
<b>sex</b>	String	OPTIONAL
Gender of the patient.		
Allowed values: 1 for Male, 2 for Female, 9 for Not Specified		
<b>age</b>	String	OPTIONAL
The age in years of the patient.		
<b>arrivalModeCode</b>	String	OPTIONAL
How the patient arrived at the ED: e.g. by ambulance dispatched by pre-hospital emergency service (EMS), by helicopter dispatched by EMS, transferred from an ED of another Hospital, Self-presented/by their own means		
E.g.: 1: Ambulance from 112, 2: Ambulance from another hospital, 3: Autonomous (by own means), 4: Other (fire department, military ambulance, etc.), 5: Not known.		
The Hospital has to provide a table containing the description of each code.		

### Triage entity

The {**triage**} entity represents the triage event of a patient in the ER and is described using the following JSON object:

```
{
  "triageDateTime": "2022-06-22T15:13:23",
  "triagePriority": 2,
}
```

Where:

<b>triageDateTime</b>	String	OPTIONAL
Date and time of triage.		
Date format: "YYYY-MM-DDTHH:mm:ss"		
<b>triagePriority</b>	String	OPTIONAL
Urgency level assigned to the patient and therefore priority for the assigned medical visit.		
E.g.: Code - Description: 1,2,3,4,5,6, X (Not performed)		
The Hospital has to provide a table containing the description of each code.		

### pathAssignment entity

The {**pathAssignment**} entity represents the set of information relating to path assignment in the ED and is described through the following JSON object:

```
{
  "idObject": "123",
  "edPathAssignmentDateTime": "2022-06-22T15:13:23",
  "pathCode": "5"
}
```

Filled with as many elements of the pathAssignment entity as there are laboratory tests.

<b>idObject</b>	String	OPTIONAL
An identifier of a secondary object that uniquely identifies it.		
<b>edPathAssignmentDateTime</b>	String	OPTIONAL
Date and hour of the path assignment of the patient		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>pathCode</b>	String	OPTIONAL
ED path identification code.		
E.g.: 1. High complexity area; 2. Low complexity area; 3. Paediatric fast-track; 4. Ophthalmologic fast-track		
The Hospital has to provide a table containing the description of each code.		

### revaluation entity

The {**revaluation**} entity represents the Revaluation of the priority level and is described using the following JSON object:

```
{
  "idObject": "123",
  "revaluationTime": "2022-06-22T15:13:23",
  "newPriorityLevel": "2"
}
```

where:

<b>idObject</b>	String	OPTIONAL
An identifier of a secondary object that uniquely identifies it.		
<b>revaluationTime</b>	String	OPTIONAL

Date and hour of the re-evaluation of the patient's triage/priority level

Date format: "YYYY-MM-DDTHH:mm:ss"

<b>newPriorityLevel</b>	String	OPTIONAL
-------------------------	--------	----------

New priority level code assigned to the patient

E.g.: Code: 1,2,3,4,5,6, X (Not performed)

The Hospital has to provide a table containing the description of each code.

### medicalVisit entity

The entity {**medicalVisit**} represents the information of the medical visit of a patient in the emergency room and is described using the following JSON object:

```
{
  "idObject": "123",
  "dateTimeMedicalVisit": "2022-06-22T15:13:23".
}
```

List of patient's medical visits.

Filled with as many elements of the medicalVisit entity as there are patient's visits.

Where:

<b>idObject</b>	String	OPTIONAL
-----------------	--------	----------

An identifier of a secondary object that uniquely identifies it.

<b>dateTimeMedicalVisit</b>	String	OPTIONAL
-----------------------------	--------	----------

Date and time of doctor's taking on of the patient:

Date format: "YYYY-MM-DDTHH:mm:ss".

### imagingTest entity

The {**imagingTest**} entity represents the set of information relating to imaging tests in ED and is described through the following JSON object:

```
{
  "idObject": "123",
  "dateTimeRequestImagingTest": "2023-06-22T15:13:02",
  "dateTimeImagingTestExecution": "2023-06-22T15:13:21",
  "dateTimeImagingTestReport": "2023-06-22T15:13:35",
}
```

Filled with as many elements of the imagingTest entity as there are imaging tests.

The following test imaging reports must be extracted:

- If Dyspnoea: US, Head/neck CT, Chest CT, Chest Rx,
- if TLoC: Brain CT scan, Brain MRI, US cardiac, Chest CT scan, Pulmonary scintigraphy, Gastroscopy, Abdomen CT scan

Where:

<b>idObject</b>	String	OPTIONAL
-----------------	--------	----------

An identifier of a secondary object that uniquely identifies it.

<b>dateTimeRequestImagingTest</b>	String	OPTIONAL
Date and time of the request for imaging the test.		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeImagingTestExecution</b>	String	OPTIONAL
Date and time of the execution of the imaging test.		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeImagingTestReport</b>	String	OPTIONAL
Date and time of the imaging test report		
Date format: "YYYY-MM-DDTHH:mm:ss".		

### 1.1 labTest entity

The {labTest} entity represents the set of information relating to laboratory tests in the ED and is described through the following JSON object:

```
{
  "idObject": "123",
  "dateTimeLabTestRequest": "2022-06-22T15:13:23",
  "dateTimeLabTestExecution": "2022-06-22T15:13:23",
}
```

Filled with as many elements of the labTest entity as there are laboratory tests.

The following examinations and results must be extracted:

If Dyspnea:

pH, PaO2, PaCO2, HCO3, Lactates, Hemoglobin, Plateletsn, Leukocytes, CReactiveProtein, bloodGlucose, bloodSodium, bloodPotatium, Creatinine, Transaminases, INR, Troponin, BNP, DDimer, SARSCoV2swabTest

if TLoC:

Lactates, Hemoglobin, Platelets, Leukocytes, CReactiveProtein, bloodGlucose, bloodSodium, bloodPotatium, bloodCalcium, Creatinine, Transaminases, INR, Troponin, BNP, DDimer, CreatineKinase, BloodAlcohol, BloodDrug, UrineDrug

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of a secondary object that uniquely identifies it.		
<b>dateTimeLabTestRequest</b>	String	OPTIONAL
Date and time of the request for the lab test		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeLabTestExecution</b>	String	OPTIONAL
Date and time of the lab test execution		
Date format: "YYYY-MM-DDTHH:mm:ss".		

### otherTest entity

The {otherTest} entity represents the set of information relating to other tests in the ED and is described through the following JSON object:

```
{
  "idObject": "123",
  "dateTimeRequestOtherTest": "2022-06-22T15:13:23",
  "dateTimeOtherTestExecution": "2022-06-22T15:14:23",
  "dateTimeOtherTestReport": "2022-06-22T15:15:23",
}
```

Filled with as many elements of the otherTest entity as there are other tests.

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of a secondary object that uniquely identifies it.		
<b>dateTimeRequestOtherTest</b>	String	OPTIONAL
Date and time of the request other test		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeOtherTestExecution</b>	String	OPTIONAL
Date and time of the other test execution		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeOtherTestReport</b>	String	OPTIONAL
Date and time of the other test report		
Date format: "YYYY-MM-DDTHH:mm:ss".		

### vitalParameter entity

The {vitalParameter} entity is the set of vital parameters collected during triage in the Emergency Department and is described through the following JSON object:

```
{
  "idObject": "123",
  "dateTimeDetection": "2022-06-22T15:13:23"
}
```

Filled with as many elements of the vital parameters entity as there are parameters detected

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of a secondary object that uniquely identifies it.		
<b>dateTimeDetection</b>	String	OPTIONAL
Vital signs monitoring start date and hour		
Date format: "YYYY-MM-DDTHH:mm:ss"		

### nursingCareNote entity

The entity {**nursingCareNote**} represents the set of information of the nursing taking charge event and is described through the following JSON object:

```
{
  "idObject": "123",
  "dateTimeNote": "2022-06-22T15:13:23"
}
```

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of a secondary object that uniquely identifies it.		
<b>dateTimeNote</b>	String	OPTIONAL
Date and time of nurse's taking on of the patient. Date format: "YYYY-MM-DDTHH:mm:ss".		

### clinicalDiary entity

The entity {**clinicalDiary**} represents the information of the clinical diary of a patient in ED and is described using the following JSON object:

```
{
  "idObject": "123",
  "dateTimeClinicalDiary": "2022-06-22T15:13:23".
}
```

List of patient's clinical diary.

Filled with as many elements of the clinicalDiaryList entity as there are patient's clinical diary.

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of a secondary object that uniquely identifies it.		
<b>dateTimeClinicalDiary</b>	String	OPTIONAL
Date and time of doctor's taking on of the patient: Date format: "YYYY-MM-DDTHH:mm:ss".		

### medicalProcedure entity

The entity {**medicalProcedure**} represents the information of the medical procedures of a patient in ED and is described using the following JSON object:

```
{
  "idObject": "123",
  "dateTimeRequestMedicalProcedure": "2022-06-22T15:13:23",
  "dateTimeExecutionMedicalProcedure": "2022-06-22T15:13:23",
}
```

Where:

<b>idObject</b>	String	OPTIONAL
-----------------	--------	----------

An identifier of a secondary object that uniquely identifies it.

<b>dateTimeRequestMedicalProcedure</b>	String	OPTIONAL
Date and time of the medical procedure request		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dateTimeExecutionMedicalProcedure</b>	String	OPTIONAL
Date and time of the medical procedure execution		
Date format: "YYYY-MM-DDTHH:mm:ss".		

### specialistConsultancy entity

The {**specialistConsultancy**} entity represents consultations performed in ED and is described using the following JSON object:

```
{
  "idObject": "123",
  "dateTimeSpecialistConsultancy": "2023-06-22T15:14:18",
}
```

Filled with as many consultations as there are consultations performed.

Where:

<b>idObject</b>	String	OPTIONAL
An identifier of a secondary object that uniquely identifies it.		
<b>dateTimeSpecialistConsultancy</b>	String	OPTIONAL
Date and time of patient specialist consultancy		
Date format: "YYYY-MM-DDTHH:mm:ss".		

### pharmaceuticalTherapy entity

The {**pharmaceuticalTherapy**} entity represents the pharmaceutical therapy prescription and administration performed in ED and is described using the following JSON object:

```
{
  "idObject": "123",
  "dateTimeTherapyPrescription": "2022-06-22T15:13:23",
  "dateTimeTherapyAdministration": "2022-06-22T15:13:23",
}
```

where:

<b>idObject</b>	String	OPTIONAL
An identifier of a secondary object that uniquely identifies it.		
<b>dateTimeTherapyPrescription</b>	String	OPTIONAL
Pharmaceutical therapy administration - date and hour		

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>dateTimeTherapyAdministration</b>	String	OPTIONAL
Pharmaceutical therapy administration - date and hour		

Date format: "YYYY-MM-DDTHH:mm:ss".

### respiratorySupport entity

The {respiratorySupport} entity represents the filled field with date and time of start and end of respiratory support in ED and is described using the following JSON object:

```
{
  "startTimeRespiratorySupport": "2022-06-22T15:13:23",
  "endTimeRespiratorySupport": "2022-06-22T15:13:23"
}
```

where:

<b>startTimeRespiratorySupport</b>	String	OPTIONAL
Respiratory support start date and hour		

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>endTimeRespiratorySupport</b>	String	OPTIONAL
Respiratory support end date and hour		

Date format: "YYYY-MM-DDTHH:mm:ss".

### monitoring entity

The {monitoring} entity represents the filled field with date and time of start and end of monitoring support in ED and is described using the following JSON object:

```
{
  "startTimeMonitoring": "2022-06-22T15:13:23",
  "endTimeMonitoring": "2022-06-22T15:13:23"
}
```

Dove:

<b>startTimeMonitoring</b>	String	OPTIONAL
Monitoring start date and hour		

Date format: "YYYY-MM-DDTHH:mm:ss".

<b>endTimeMonitoring</b>	String	OPTIONAL
Monitoring end date and hour		

Date format: "YYYY-MM-DDTHH:mm:ss".

### discharge entity

The {discharge} entity represents the discharge and is described using the following JSON object:

```
{
  "dischargeDecisionDateTime": "2022-06-22T15:13:23",
  "dischargeDateTime": "2022-06-22T15:13:23",
  "modeOfExit": "3",
  "diagnosisAtEDDischarge": "OTHER CHEST PAIN"
}
```

where:

<b>dischargeDecisionDateTime</b>	String	OPTIONAL
Date and time of the decision to admit/transfer to another hospital/discharge, if the patient has to wait for a bed or a transfer to another hospital (boarding).		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>dischargeDateTime</b>	String	OPTIONAL
Date and time of patient discharge from the ER.		
Date format: "YYYY-MM-DDTHH:mm:ss".		
<b>modeOfExit</b>	String	OPTIONAL
Mode of exit.		
Allowed values: 1- if admitted, 2 - if transferred, 3 - if decease,4 - if voluntary abandonment.		
<b>diagnosisAtEDDischarge</b>	String	OPTIONAL
Diagnosis at the end of hospitalisation		
Format: Alphanumeric string up to 2000 characters.		

### obsUnit entity

The {obsUnit} entity represents the set of information about the patient's presence in the OBSUNIT and is described using the following JSON object:

```
{
  "decisionObsUnit": "2022-06-22T15:13:23",
  "transferObsUnit": "2022-06-22T15:13:23",
  "exitObsUnit": "2022-06-22T15:13:23"
}
```

Where:

<b>decisionObsUNIT</b>	String	OPTIONAL
Date and time of decision to Short Stay Observation Unit		
Format: "YYYY-MM-DDTHH:mm:ss".		
<b>transferObsUnit</b>	String	OPTIONAL
Date and time of transfer to Observation Unit		
Format: "YYYY-MM-DDTHH:mm:ss".		
<b>exitObsUnit</b>	String	OPTIONAL
Date and time of exit to Observation Unit		
Format: "YYYY-MM-DDTHH:mm:ss".		