Founda Health Product

Explained

Table of contents

Chapter 1

Introduction

Globally, the way healthcare is delivered is changing. The traditional model, where patients physically go to a care location like a hospital, is shifting towards providing health services closer to the patient.

This may entail delivery of care at home, online consultations between patients and providers, healthy lifestyle management and/or blending and even replacing physical interactions with online services – such as appointment scheduling, questionnaires, etc. New technologies and solutions are developing faster than ever, and many new modern applications are entering the healthcare domain to help with this digital transformation.

When it comes to preparing healthcare for the future challenges – aging population, cost increases, smaller workforce, etc. – this shift to digital is considered positive. However, the transition to digital is also seen as a complex endeavor. Healthcare is known for the huge quantity of legacy systems, the complex regulatory and legal frameworks with regard to security and patient privacy, and the lack of standardised processes and connectivity.

With the Founda Health Platform we strive to enable new and innovative collaboration models that all partners benefit from by enabling transparent and secure interoperability among healthcare (provider) organisations and application providers. The platform exposes a number of services, allowing applications outside a hospital's realm to connect to, and interact with, the Electronic Medical Record (EMR) system within the hospital. In this document we describe the interaction patterns with these third party applications.

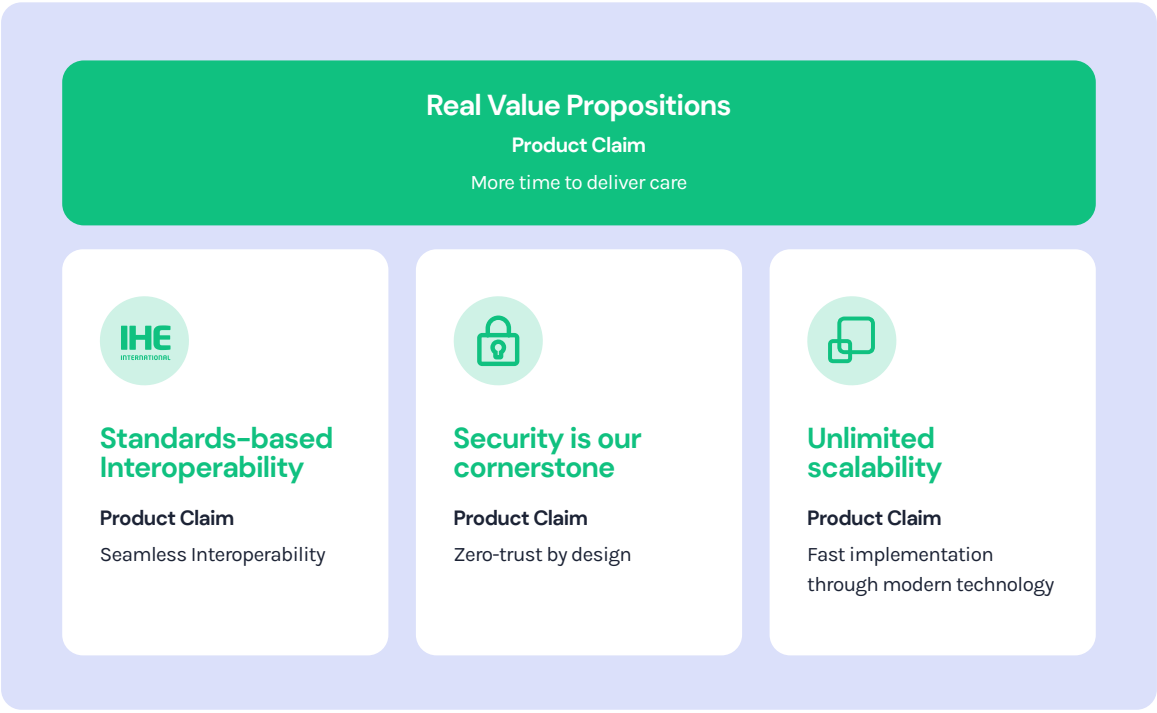
Chapter 2

The Founda Health Roadmap: 3 themes

The Founda Health Platform takes away the complexities that currently come with digital transformation for healthcare organisations (referred to as 'Provider Organisation').

To do so, we focus on three important product themes:

1. Standards-based interoperability
2. Security as a cornerstone
3. Scalability



These themes help prioritise the features and functionalities the Founda Health Gateway has to offer. This way we ensure the Gateway can be used to implement solutions that provide real value to healthcare professionals.

Standards-based Interoperability

Interoperability in healthcare has multiple interpretations. In general, it is denoted as the means necessary to exchange patient related information in order to execute care processes efficiently.

But this broad definition often makes it difficult to achieve successful interoperability. Alignment is not only required at technical or technology levels, but also on information, semantic and process models. Not to forget the regulatory and legal requirements that need to be taken into account.

Among the more (in)famous models for interoperability are the HIMSS model, and the European Interoperability Framework (EIF).

Each of these models emphasise that interoperability is the sum of technical, semantic and process interoperability seen within the context of regulations and legislation specific to healthcare. As both the infrastructure and application layers in these models are on a path to commoditisation, the challenges are perceived in achieving information and process interoperability.

This means that the Founda Health Gateway has to be more than "just another" cloud-based multi-tenant platform that facilitates technical connectivity using FHIR-based restful APIs. The APIs we offer, support the secure exchange of patient information in the context of care processes. Therefore, the APIs are compliant with security and privacy regulations. To provide real added value, the Provider Organisation is empowered to incorporate new applications into their existing care processes. Without the hassle, costs and complexity that comes with current application integration projects.

Founda Health chose to base its interoperability on the principles of IHE . More specifically, we implement APIs that follow the guidelines of IHE Integration Profiles that use HL7 FHIR as information model and transport protocol.

IHE
INTERNATIONAL

Security as a cornerstone

As already briefly touched upon, security regulations in healthcare are very much focussed on protecting the patient's privacy. Medical information is privacy-sensitive data that, if put in the wrong hands, can cause severe damage.

Organisations that process personal health information must comply with security and privacy regulations, as do the product and solutions they use. The majority of these regulations focus on controls to ensure privacy-sensitive data is not exposed to unauthorised users, audit logging and controls to safeguard that sensitive data is used in its 'intended way'.

Healthcare organisations demand solutions they use to adhere to relevant regulations, and to provide functionality to audit data being processed. As a result, the Founda Health Gateway includes functionality to this purpose. Hence, the Gateway:

- Encrypts all data both in transit as in rest.
- Includes and audits record repository to trace all internal and external transactions
- Gives the Provider Organisation full control to authorise Application Providers (and their Apps) to process their patients data.

Scalability

Provider Organisations want a platform that is able to handle the increasing volume of Application Providers that the Provider Organisation wants – or needs – to connect with.

Hence, the Provider Organisation connection to the Founda Health Gateway is reusable beyond the first application that is connected. This reusability and scalability have a technical dimension (scaling performance, security, etc.), and a clinical dimension (scaling use-cases and the number of Application Providers connecting with).

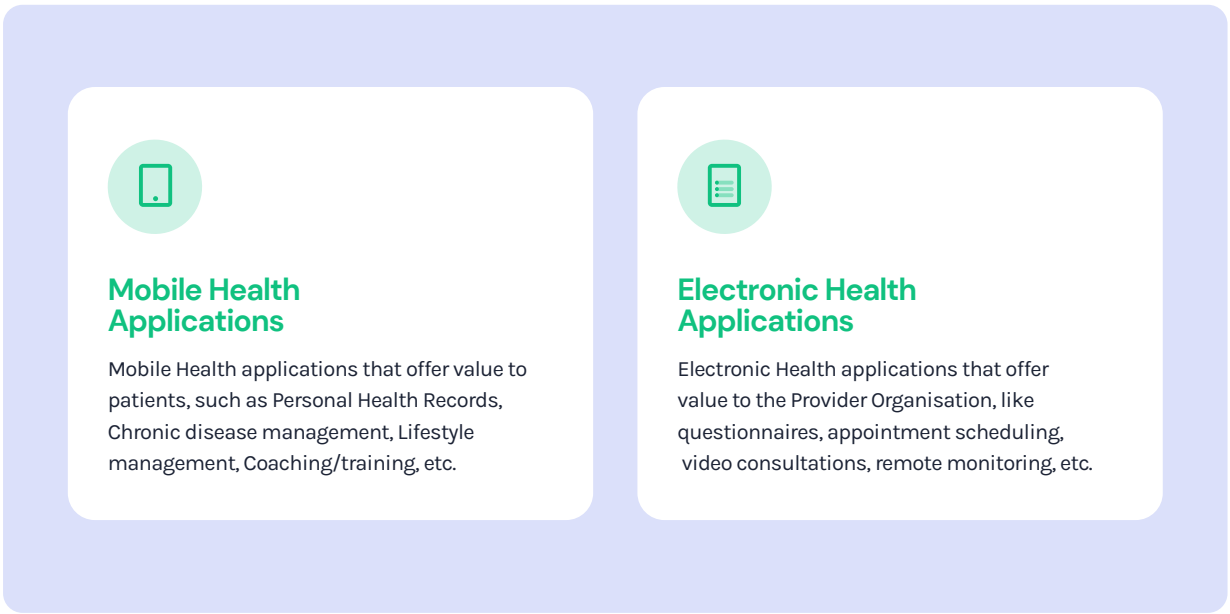
Founda Health builds a multi-tenant platform that provides 'economy of scale' when many Provider Organisations and Application Providers use the platform. Therefore, the platform is designed for scalability from its core.

Chapter 3

Application Services for eHealth/mHealth

The Founda Health Gateway offers functionality for use-cases within the mHealth and eHealth application domain.

In this domain Application Providers can be generalized to:



Mobile Health Applications

Mobile Health applications that offer value to patients, such as Personal Health Records, Chronic disease management, Lifestyle management, Coaching/training, etc.

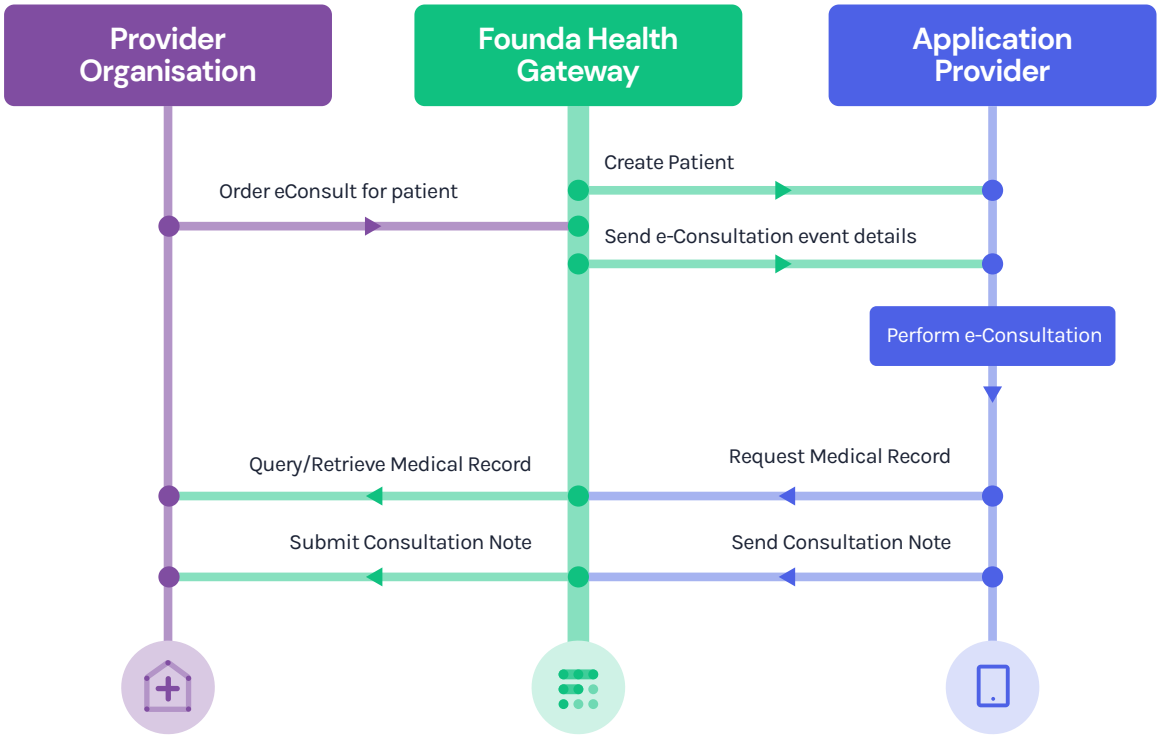
Electronic Health Applications

Electronic Health applications that offer value to the Provider Organisation, like questionnaires, appointment scheduling, video consultations, remote monitoring, etc.

See a complete list of our partnered apps here.

For the Provider Organisation, the challenges that come with incorporating eHealth and mHealth applications into the daily clinical routines are multi-level:

1. Privacy sensitive patient data cannot be made available to external applications without obeying security and privacy regulations.
2. Data sharing between Provider Organisation and Application Providers is hindered by the lack of a shared patient identity.
3. Using external applications within the context of an existing clinical process often results in duplication of work (and many manual interventions).
4. Interactions between Provider Organisation and patients are not synchronised with the interaction between patients and 3rd party application.
5. Data shared between Provider Organisation and Application Providers are often not standardised and semantically not interchangeable.



From these interaction patterns, two foundational services are defined: the Patient Demograpics & Events Service, and the Clinical Information Exchange Service.

Patient Demographics & Events Service

This Service focuses on the first two interaction patterns, i.e., sharing patient demographics and event details.

The Provider Organisation is at all times the owner of all patient demographic data (name, birthdate, sex, address, height, weight, etc.) and the electronic patient identifier that is used to uniquely identify a patient record within the provider organisation.

Events are considered 'triggers' that occur during clinical processes that take place at the Provider Organisation. Under the assumption that most clinical processes are managed by the EMR, these events are often linked to real-world activities such as:

- Patient admission, discharge and/or transfer.
- Scheduling a patient for a clinical procedure.
- Ordering a specific diagnostic examination, for example a lab test or imaging procedure.
- Booking an appointment for an out-patient visit.

The challenge in this is that these trigger events are not always as clear as the list above suggests. These trigger events should therefore be seen as task initiators. For example: the trigger event of scheduling a patient for a procedure, may lead to the task of sending out a pre-procedure questionnaire to the patient.

To summarise, the Founda Health Gateway Patient Demographics and Event (PD&E) service facilitates the distribution of tasks from Provider Organisation to an Application Provider, based on trigger Events defined by the provider.

Event Patterns

In general, there are three main communication patterns to deliver a message from sender to receiver:

- push based from sender to receiver
- pull based from receiver to sender
- subscription based, whereby receiver subscribes to specific tasks

Push and pull based communication patterns are suitable for one-to-one (a.k.a. point-to-point) interactions. Subscription patterns are suitable for configurations where a single input may need to be distributed to multiple recipients that are not directly connected to the sending system. Subscription patterns can still be used for one-to-one interactions if the number of subscribers is limited to one.

Implementing a subscription pattern requires a 'subscription manager', allowing recipients (the applications) to subscribe to specific events and tasks they are interested in. For example: a questionnaire application may subscribe itself to receive tasks to send a specific set of questions to the patient. The subscription manager that 'listens' to events generated by the Provider Organisation will evaluate its list of subscribers to determine whether or not to send them the task that is triggered by the event.

Example

A patient has a new email address and this is updated in the EMR. If the patient uses multiple applications (e.g., for PROMs, patient journey and medication adherence), all these applications need to update the new email address as well. With the subscription pattern, any inputs – the updated email address in this case – will be sent to all the subscribed recipients (applications) that need to receive the input.

To use the same questionnaire example as before; the trigger event can be the activity where a patient is scheduled for a clinical procedure inside the EMR. The EMR subsequently sends an HL7 ADT message to the Founda Health Gateway. Then, the Gateway transforms the event into a task that corresponds with the event. The subscription manager then evaluates the list of subscribers and identifies the questionnaire application as the intended recipient for the task. It forwards the task to the application. In turn, the application recognises it as a task to start a questionnaire. The application reads the information provided in the task (patient id, procedure code, etc.), and initiates its own process to make the questionnaire available to the patient.

Patient Registry

Another element of the PD&E services is the 'Patient Registry'. A patient registry is defined as a component that keeps track of patient demographic information, and has the ability to link multiple (electronic) patient identities referring to the same human patient. The latter is also referred to as a **'Master Patient Index'**.

The patient registry facilitates the discovery and transformation of patient identifiers when data is exchanged between systems that internally use different identifiers for the same patient. It is often used to keep a 'master patient record', that includes the latest actual patient demographics.

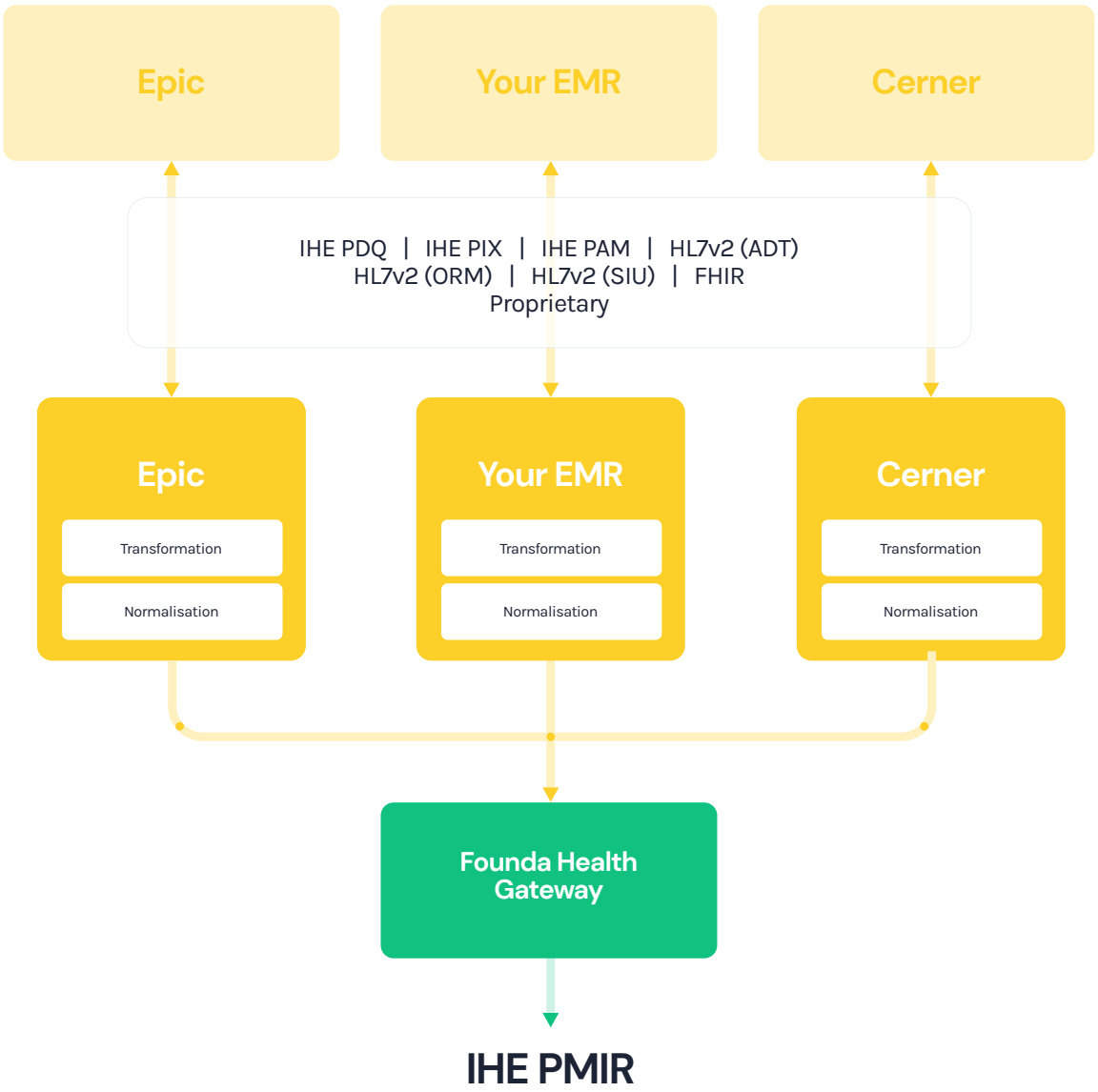
Among the need for the Founda Health Gateway to offer a patient registry functionality, is the fact that in most interaction patterns someone has to keep track of the links between the Patient ID used by the Provider organisation, and the Patient ID used by the Application Provider. Even in geographies where there is a unique National Patient ID present, local regulations often prevent this National ID (e.g., BSN, NIN or SSN) to be shared or used.

Therefore, the patient registry offered by the Founda Health Gateway is used in a single-tenant fashion, supporting the data exchange between a specific Provider Organisation and the Application Providers it has authorised.

An often used interaction pattern is one where the Provider Organisation sends a patient identity feed to the patient registry, upon which the patient registry forwards the feed to registered applications that have been authorised to receive these feeds. When registering a patient in an (external) application, it updates the Patient Registry with the Patient ID used for that patient. The Patient Registry then stores, updates or removes Patient ID links.

Connecting to the EMR

The PD&E service extends the Provider Organisation's EMR to applications outside the provider's IT domain. Each EMR will provide its own unique way of connecting to it in order to receive a trigger event.



Clinical Information Exchange Service

The Clinical Information Exchange Service focuses on the latter two foundational interaction patterns. It serves the need to exchange data from a Provider Organisation to an application, and vice versa.

Clinical data types

There are three types of clinical data:

- Document based data
- Discrete data
- Imaging data

Document based data mostly represents digital versions of "paper" records. This can literally mean 'scanned paper documents' – like a PDF. However, more and more documents are becoming available as structured data (e.g., HL7v3 CDA, FHIR Documents, DICOM Structured Reports, etc.). The vast majority of clinical information is available in some document format.

Discrete data mostly represents 'point in time observations'. Traditionally, laboratory results and medication information have been the bulk of discrete data. Discrete data typically has a structure; think of an observation where the structure will tell what was observed or measured, and which units were used for the measurement (mmol/l, heartbeats per minute, etc.).

Imaging data is considered to be a special class given the fact that it neither fits the document, nor the discrete data paradigm well. Diagnostic Imaging Data often follows the DICOM format that is exchanged using DIMSE Services. Alternative to the latter are IHE XDS-I, and DICOM WebServices.

Keep in mind

Structured information and discrete data are different things. For example, a discharge summary can be exchanged as a structured document that may (or may not) carry discrete data. Similarly, in a message based exchange the message may follow a structure that may or may not contain discrete data. With FHIR it is possible to exchange structured elements (resources) that contain discrete data (age, weight, height, eye-color, etc.).

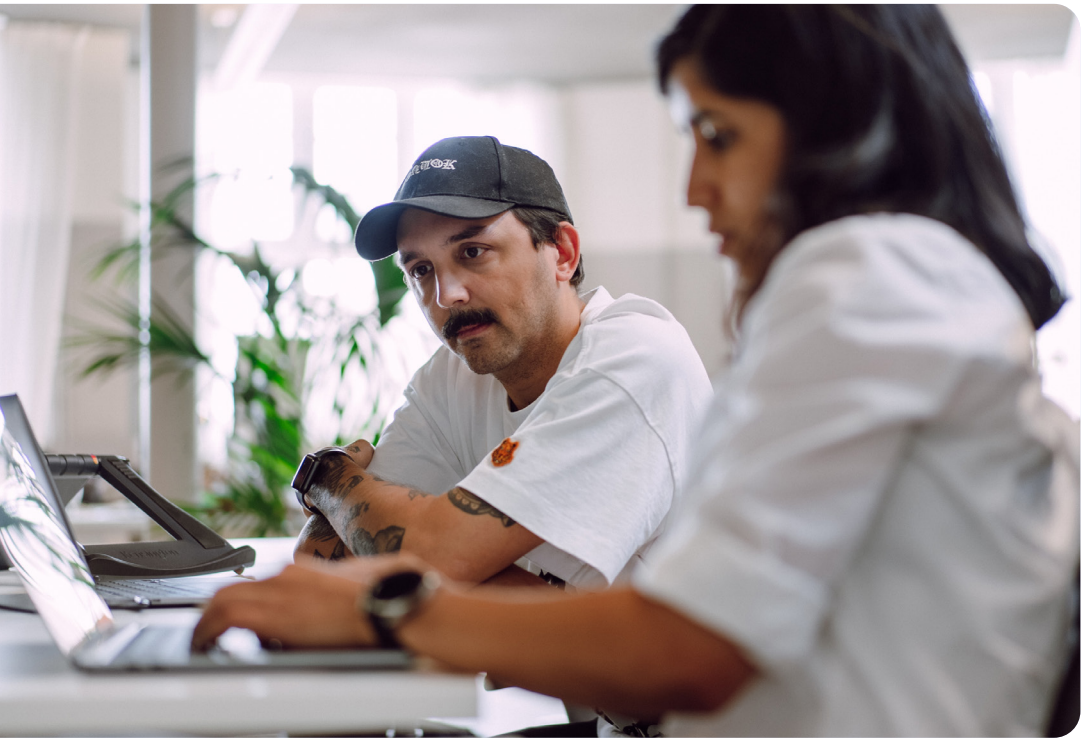
Standards-based APIs

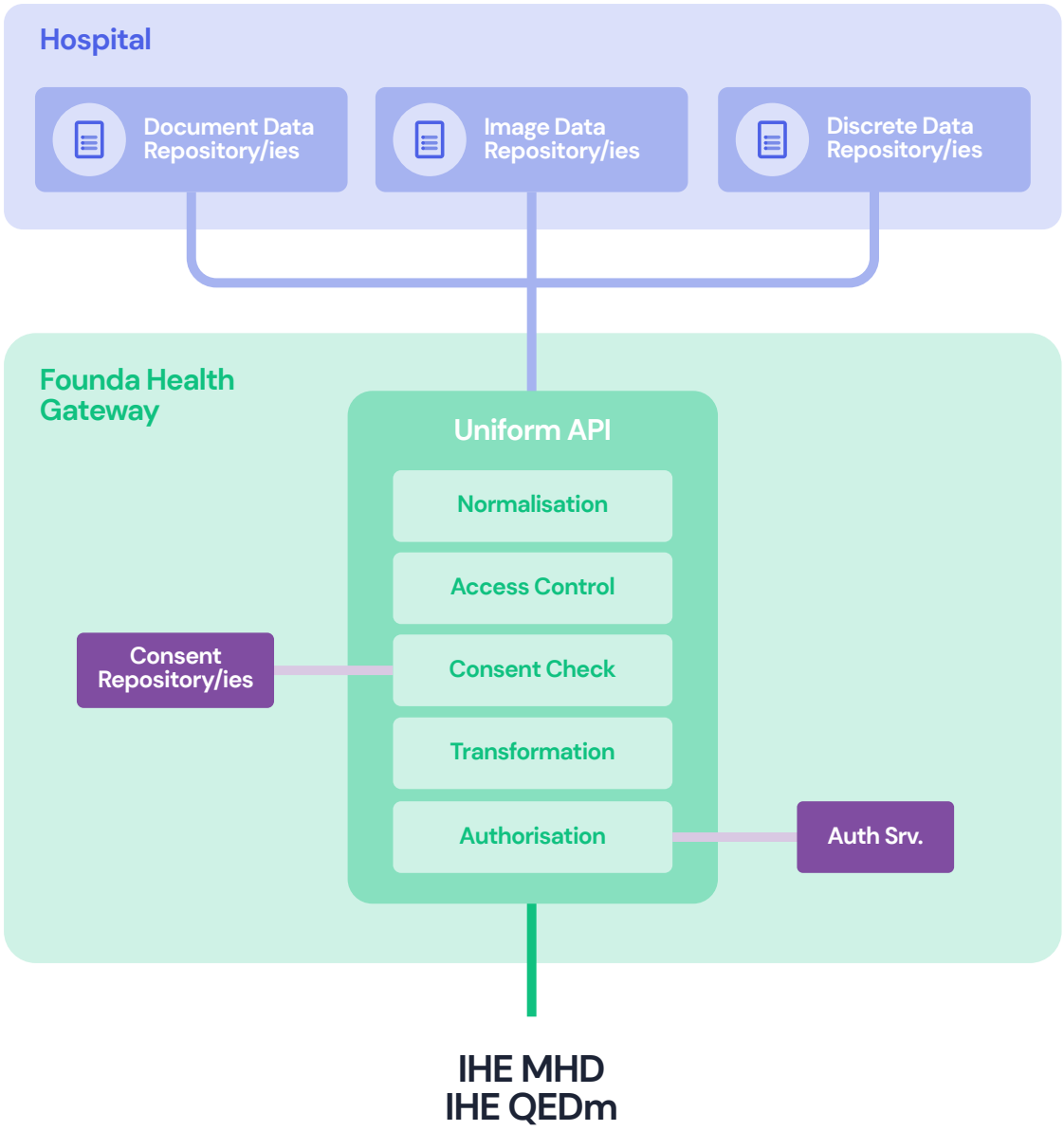
In the quest to search for standards-based interaction patterns, two are relevant for the Founda Health Gateway. The first is a pattern to discover (query), retrieve and provide document based data. The second pattern caters to the provisioning and retrieval of discrete data.

Mobile Access to Health Documents (MHD)

The IHE MHD profile fits the first patterns and details how to use FHIR Restful APIs to query, retrieve and provide clinical documents – both structured and unstructured. It uses three transactions to allow a mobile application to retrieve a list of available clinical documents and to retrieve a specific document of interest. Furthermore, it specifies a transaction that allows for the provision of a clinical document from a client (i.e., mobile application) to a server (i.e., EMR)

The Founda Health Gateway fronts a Provider Organisation and needs to orchestrate the MHD interaction between multiple external applications and the providers EMR.





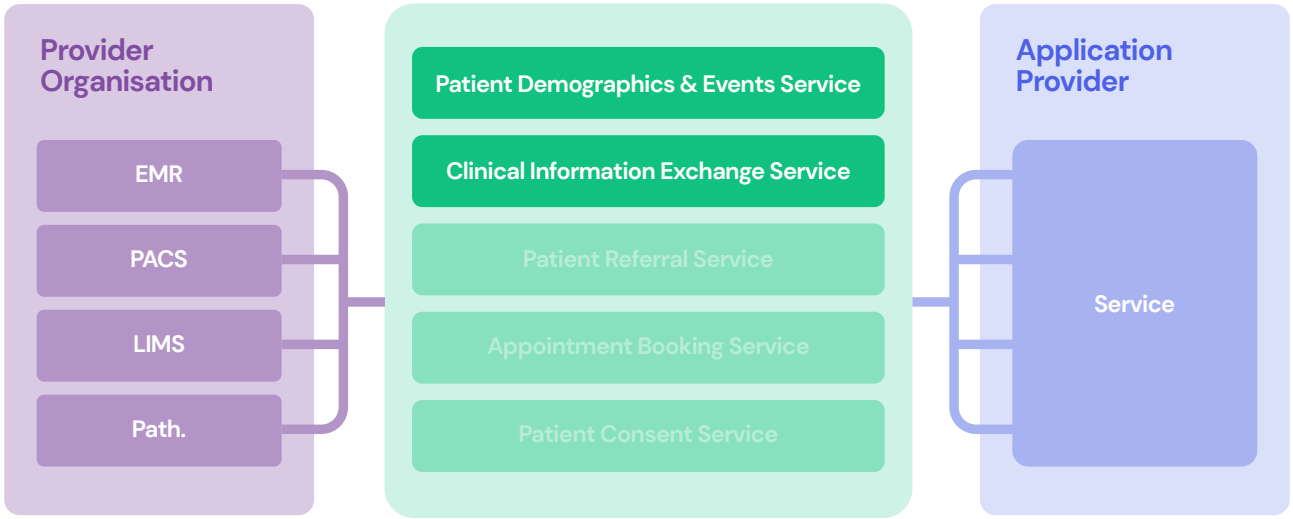
Query for Evidence Data

The IHE QEDm profile fits the second pattern and specifies a generic FHIR-based API front to retrieve discrete data. It should be noted that the QEDm profile does not detail how it collects the discrete data from a back-end system. Theoretically, it could pull discrete data from one or more structured documents to fulfil a retrieve request.

The application facing side of the Founda Health Gateway offers a series of standards-based API, allowing access to data maintained by a Provider Organisation. To facilitate the normalisation and transformation of clinical data – in order for it to be exchanged and interpreted – the Gateway provides functionality, tooling and service. In the next chapter, we dive into how such functionalities are implemented as platform services.

Summary

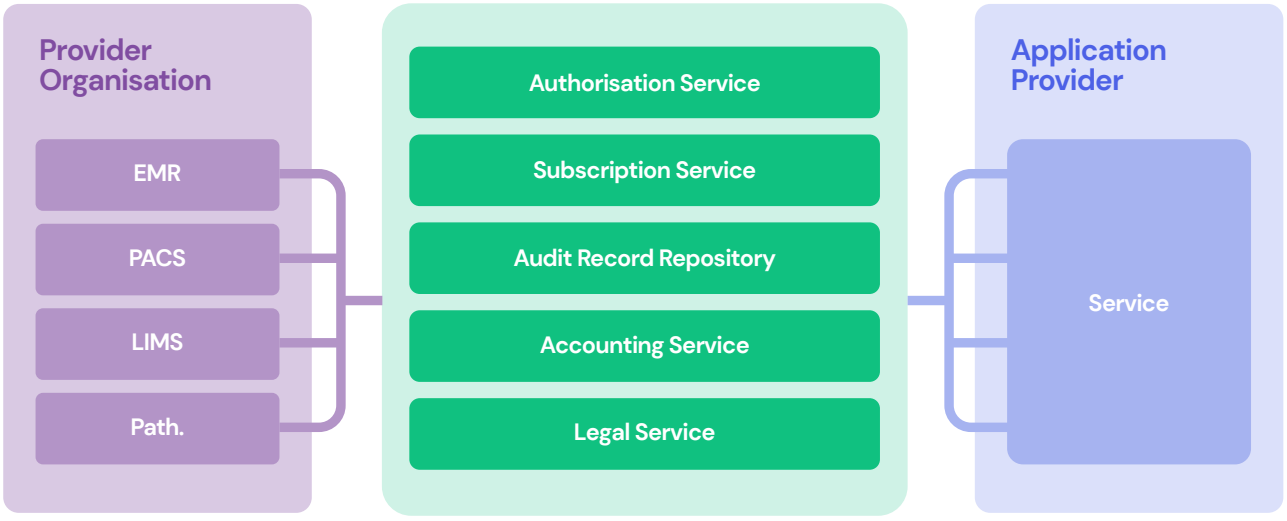
Two services were introduced that the Founda Health Gateway offers to Application Providers that need to interact with Provider Organisations. These are the first two that will be followed by other services as we extend the gateway over time.



Chapter 4

Foundational Platform Services

In support of the Application Services the Founda Health Gateway also offers a number of platform services – those are considered 'enabling services' – that support the mHealth and eHealth scope discussed in the previous chapter. In this chapter, we will dive deeper into these platform services.

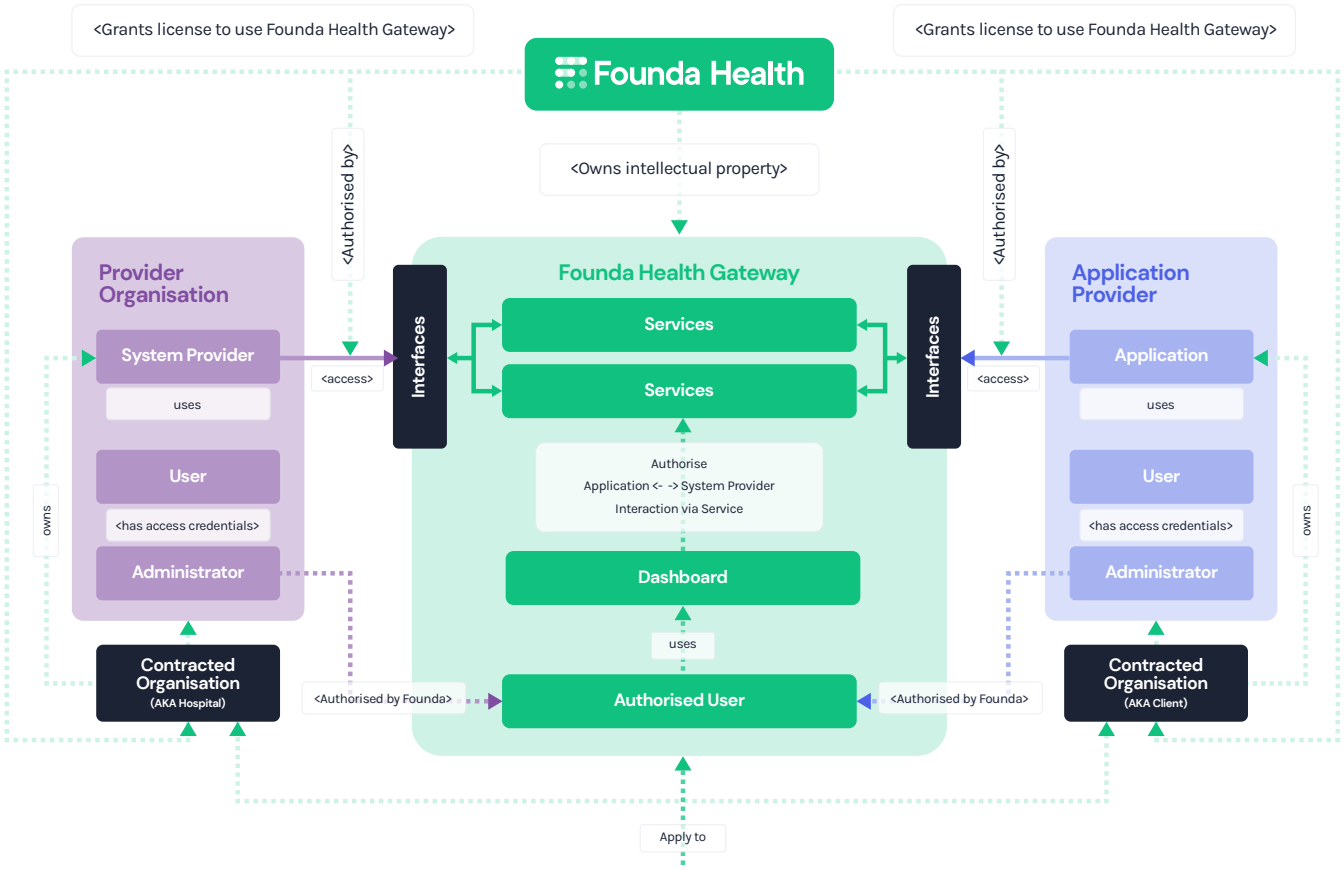


Authorisation Service

The authorization service enables Provider Organisations to authorise applications of Application Providers registered with the Founda Health Gateway to use their (functional) services. This service is a key component of Founda's security and compliance framework that guarantees full control to the Provider Organisation about what can happen with their patients' data.

This service will develop and grow with the other services we develop. Authorisation includes authorization of an application in general, and what that application can do in relation to the organisation that uses it. For example, an app can be authorised to receive patient updates and tasks – e.g., create appointments, initiate questionnaires, read data, store data, etc.

The following picture highlights the authorisation step:



Subscription Service

The subscription service enables Application Providers to subscribe themselves to specific events triggered inside the Provider Organisation. Through the authorisation service, the Provider Organisation decides which subscription requests are activated.

Audit Record Repository Service

The audit record repository service enables the ability to store and retrieve audit event records. Audit Events are defined as a result of the functionality the Founda Health Gateway offers and the transactions it supports. Both the audit record and audit repository play an important role in Founda's compliance to ISO and NEN standards. Public auditable events (login, logout, create patient, delete patient, etc.) must be transparent to both Provider Organisation and Application Providers. Furthermore, internal transactions should be auditable as well.

About Founda Health

Founda Health is building the railroad between healthcare systems and applications to bring innovation to hospitals and improve the care for patients. Our platform connects, unlocks, translates and transmits healthcare data over our unified API. With the highest security standards and insight in data usage. We give care workers the possibility to share information with whoever they need, whenever they need and in the safest possible way.

Our mission is to enable healthcare to free-up time and space for care workers so they can focus all their energy on what they are best at: caring. We do this by supporting hospitals with their digital innovation initiatives and improving collaboration, knowledge sharing and innovation through better interoperability. Founda's deep, reusable and scalable integrations replace old, expensive and single purpose connections. This decreases the burden on IT departments at hospitals, reduces the time doctors spend on administration and ultimately increases the quality of care for patients.

Founda Health makes sure that technology is no longer a burden, but a solution. It is time for innovation in healthcare, it is time to care.

Discover our platform
Are you curious to know how Founda Health can help you to improve interoperability, unlock new growth opportunities and minimise the time spent on integration hassle?

Check out our website, or send us a message. We are happy to answer all your questions and discuss the possiblities.