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How We Deliver Personal Medical Care to the Edge

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PCI DSS COMPLIANT MADE IN LUXEMBOURG GUINNESS WORLD RECORDS

Market fit?

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The great transformation that Covid–19 brought in 2020–21 influenced all essential aspects of personal life: how we shop, how we consume, how we entertain, and, of course, **how we get medical care**.

Governmental restrictions for public activities and everyday routines sparked development of new tools and solutions to meet the demand for medical consultations.

One this tool we initiated and made. We named it **Curamedon**.

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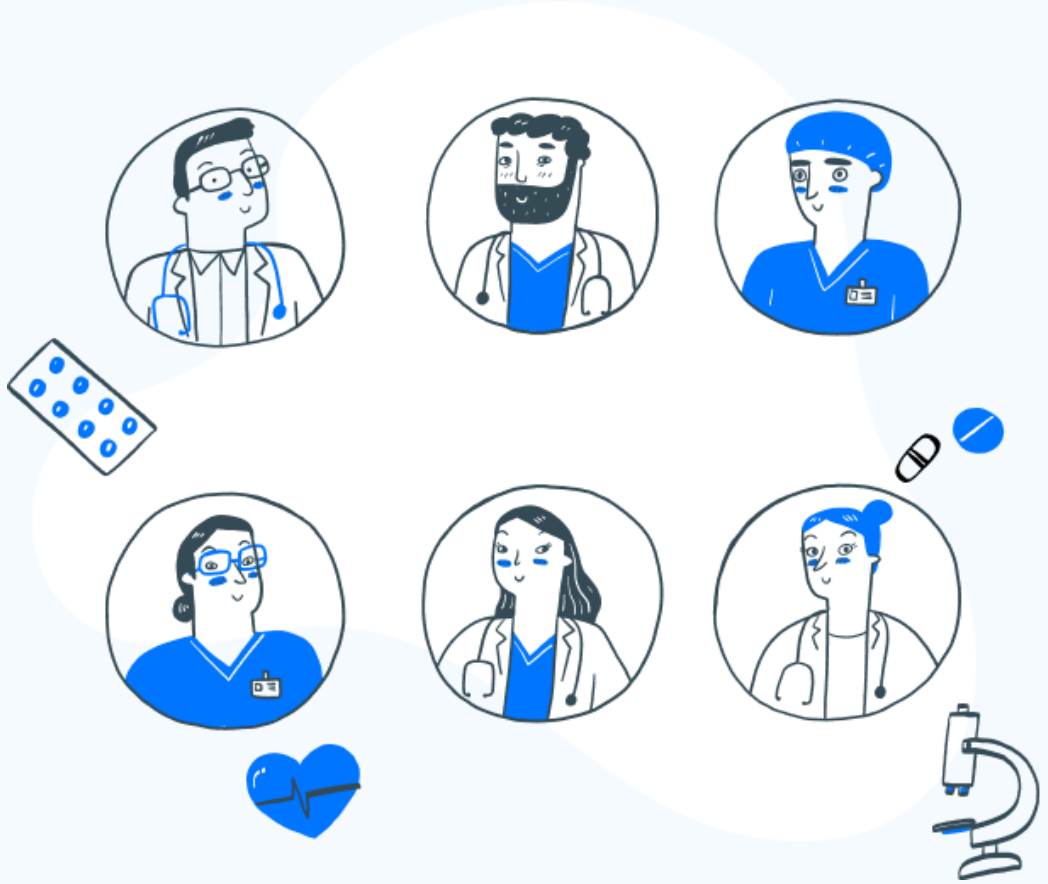
A key problem we solved

Curamedon is a next-generation telehealth platform primarily for patients who were forced to switch from consultation at the doctor's office to remote consultations.

Using the platform, you can conduct video consultations in Full HD, as well as exchange text messages and attach files. Appointment hours are synchronized with all the doctor's personal calendars, which eliminates the accidental overlap of different events.



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Values that became features that became benefits

Curamedon is a ready-made web-based service that allows health practitioners' offices to consult with patients via **videoconferencing**.

And this type of communication reflects the values that we would like to share with our clients.

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Valuable benefits

Saving time

Less time spent
per appointment

An appointment
booking 24/7

Fully automated
notifications

Awareness
of the patient’s
condition before
the consultation

Valuable benefits

Personal data security

All personal data is processed in secure and compliant infrastructure (GDPR, PCI DSS, ISO 27001)

No data sharing

No data is analyzed by third parties (such as Big Five tech giants or others)

Valuable benefits

Out-of-the-box platform

Online human records exchange (text messages and attached files)

Synchronization with external calendars on the fly

Online human records exchange (text messages and attached files)

Connection to wearable equipment and medical connected devices (coming soon)

Optional customization

White labeling for B2B

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Valuable benefits

Extra revenue for consultants

(and medical centers)

Your practice can expect an increased number of appointments

Next level in the healthcare industry

Increasing patients’ attendance with shorter treatment time and no queue

Convenient appointment reminders that reduce no shows

Core issues we faced: Security

We secure medical data storage and exchange of documents

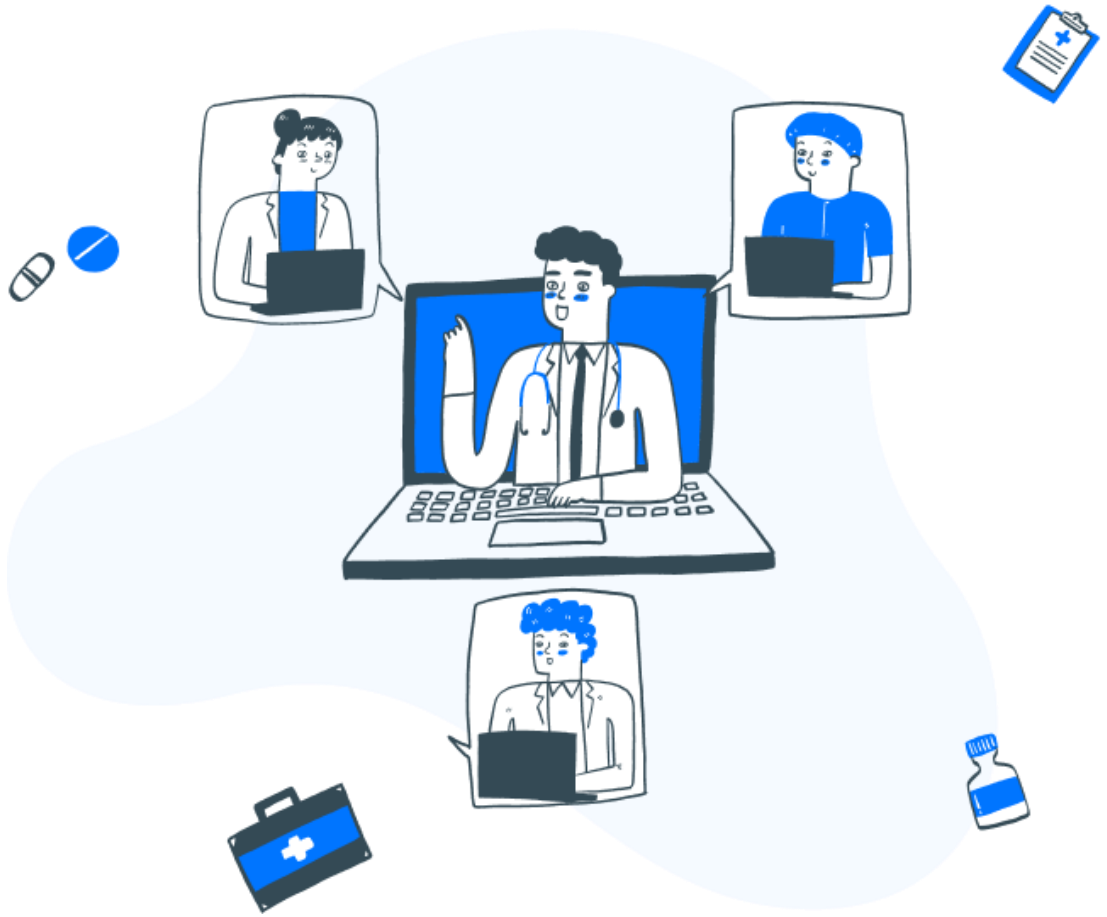
We decided to encrypt some fields on account data on application level.

We use 256-bit symmetric key and a PHP-wrapper for Sodium cryptographic library. We successfully encrypted fields which are not used for search (document description, appointment reason and notes). However, fields like firstName, lastName or email were not encrypted because we use search by these fields in back office, email is used as a user identifier, so it cannot be encrypted as well.

We use 2FA confirmation for important actions in the system (login, credentials changes, transfer beneficiaries or data download).

[The issue that is not yet solved is document encryption. We use tus protocol for uploads (so even several gigabyte files are not a problem for the system), and it means that files are split into chunks.

We use S3 as storage for files so when the next chunk of the file is uploaded, we stream it to S3 (the uploads service doesn't operate the whole file), that's why application-level encryption for files was not implemented yet. So right now, we need to resolve the issue and we are working on a solution that allows us to successfully encrypt all-size files without problems.]



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Core issues we faced: Patients disability

Because not every patient can manage his account by himself

This can happen because of different reasons, such as patient is a child or a person with disabilities. However, such patients still need to receive medical consultations including online ones.

To overcome these limitations, we developed 2 solutions:

1. Beneficiary sub-account that is managed by the adult patient (parent) or guardian.
2. Nurses' platform that includes caregivers that have rights to represent interests of patients with permanent or temporary disabilities. Nurses usually manage accounts of such patients, book appointments on their behalf and assist them during online and physical consultations.

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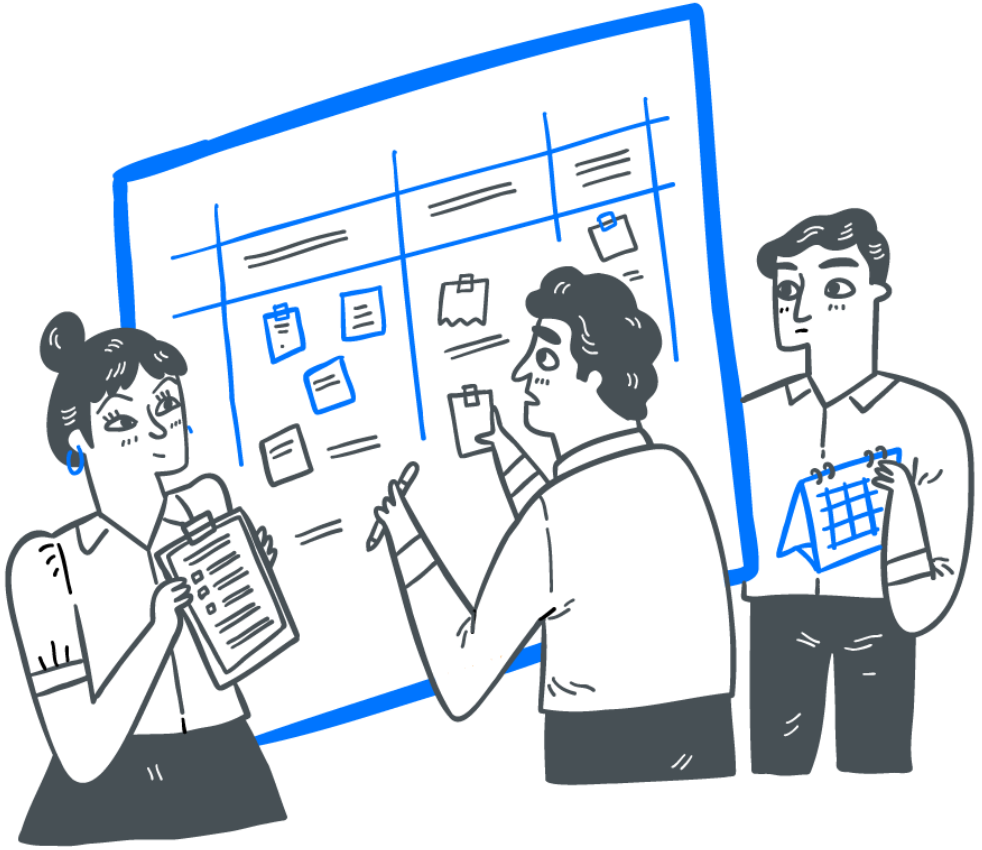
Core issues we faced: Organizational chaos

Doctors may work in different hospitals and cabinets at the same time

With an online booking tool, it is essential that there are no conflicts within the doctor’s multiple practices and all booked appointments can be conducted.

To solve this problem, we create an effective working schedule configuration tool that allows doctors to select not just generic working interval, but also state which consultation types he accepts, state duration for each consultation type, add breaks/vacations/day-offs for this schedule.

Additionally, the doctor can link his working calendar to the platform calendar and the system will recognize appointments/events from the linked calendar and forbid patients to book conflicting appointments.



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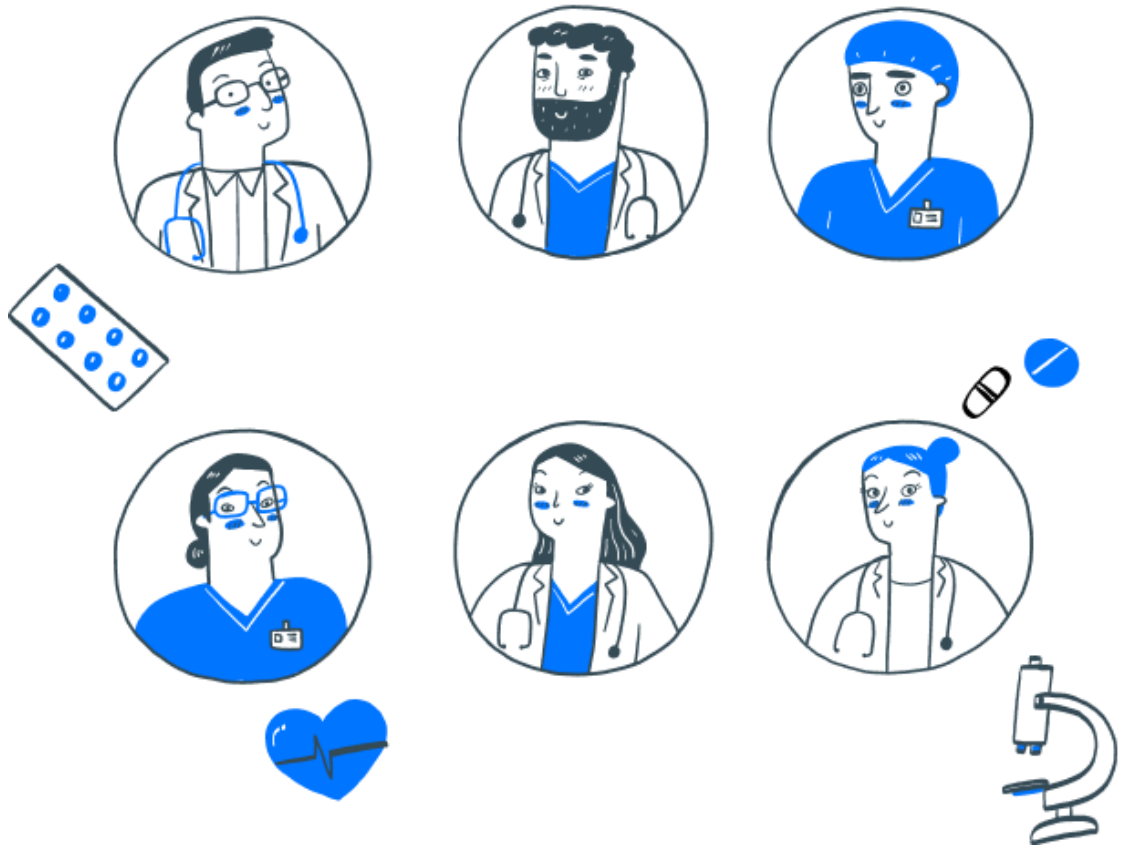
Core issues we faced: Enforced remoteness

With the Covid crisis, many patients were forced to switch from physical consultation at the doctor's office to remote consultations

Online consultations are quite a new experience for many users, that's why it was important to onboard patients with different levels of internet experience to the platform. More experienced patients can create accounts by themselves and start booking online appointments.

For the remaining part of patients, the doctors can book appointments in a regular way and send invites to register on the platform and join the online consultation. Thus, different groups of patients have different onboarding ways according to their experience.



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Exclusive solutions we realized:
Beneficiaries' management

The ability to manage multiple patient sub-accounts (for children, relatives who are not able to manage their accounts by themselves)

All medical data of such sub-accounts is kept separately and accessible only by the account holder. It is possible to transfer the sub-account to an individual account in case the beneficiary can now manage his own account (for example, when the child turns 18 years). To do so, the account holder shall state the email address of the beneficiary and the system will send an email to confirm the account transfer. Once the transfer is confirmed, all medical data (including appointments, history of appointments and documents) becomes available in the individual account. Like that the users can be sure that no data is lost, and all historical records remain available.

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Exclusive solutions we realized: Teleconferences

The ability to conduct 1-to-many video calls with up to 20 participants at the same time.

The organizer of the teleconference can track the status of each participant to ensure their presence. Online chat and document exchange
is available during teleconference.

The teleconference may involve patients who will be able to join online as well or can be organized as an internal teleconference of healthcare professionals inside a specific medical organization.

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Exclusive solutions we realized:
Teleconferences

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Exclusive solutions we realized:

Urgent appointments

The ability to organize an urgent appointment with the healthcare professional

In such a case the appointment is booked immediately without taking into consideration the doctor's working schedule and current availability.

Like that the healthcare professional can join the consultation as soon as he can.

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Success story: eSanté

How we developed and launched the telemedicine platform for the Grand Duchy of Luxembourg

Agence eSanté Luxembourg

- Founded: 2011 Luxembourg
- Website: esante.lu
- Business: Healthcare
- Gcore Services: Software Development, Streaming Platform, Cloud

WAGNERGROUP

- Founded: 1929 Luxembourg
- Website: groupwagner.lu (cmd.solutions)
- Industry: ICT
- Gcore Services: Software Development, Streaming Platform with Meet video conferencing, Cloud

The solution brought to Luxembourg

In order to facilitate access to healthcare services for its citizens throughout the local lockdown, as well as to reduce the risk of spread of the virus, the Luxembourgish government commissioned the Agence eSanté (Health Agency), to urgently deploy a “teleconsultation platform”.

The Wagner Group was selected to supply this platform and joined forces with Gcore in order to develop and deliver it.

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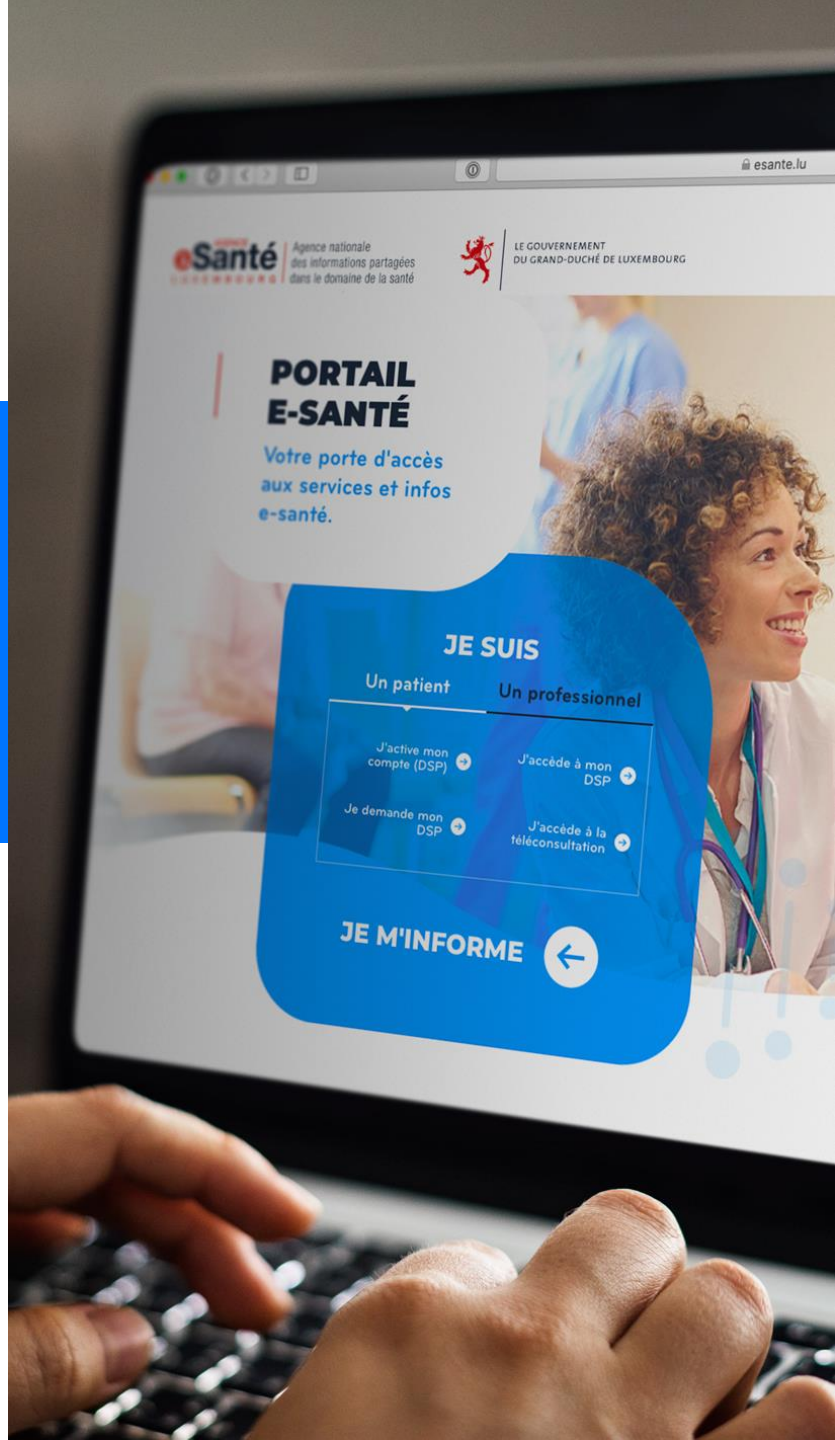
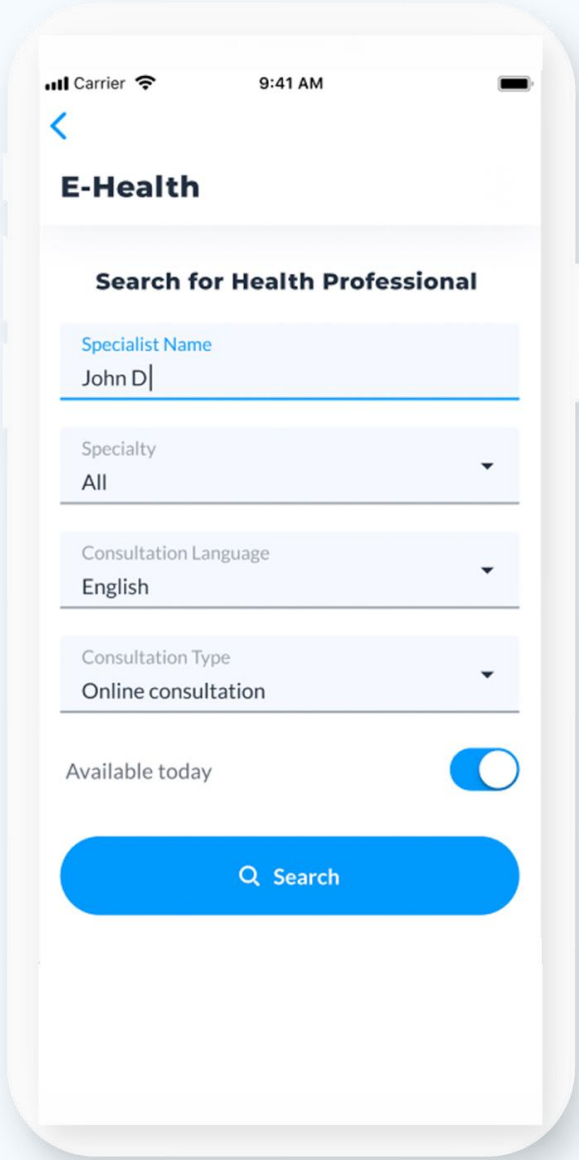
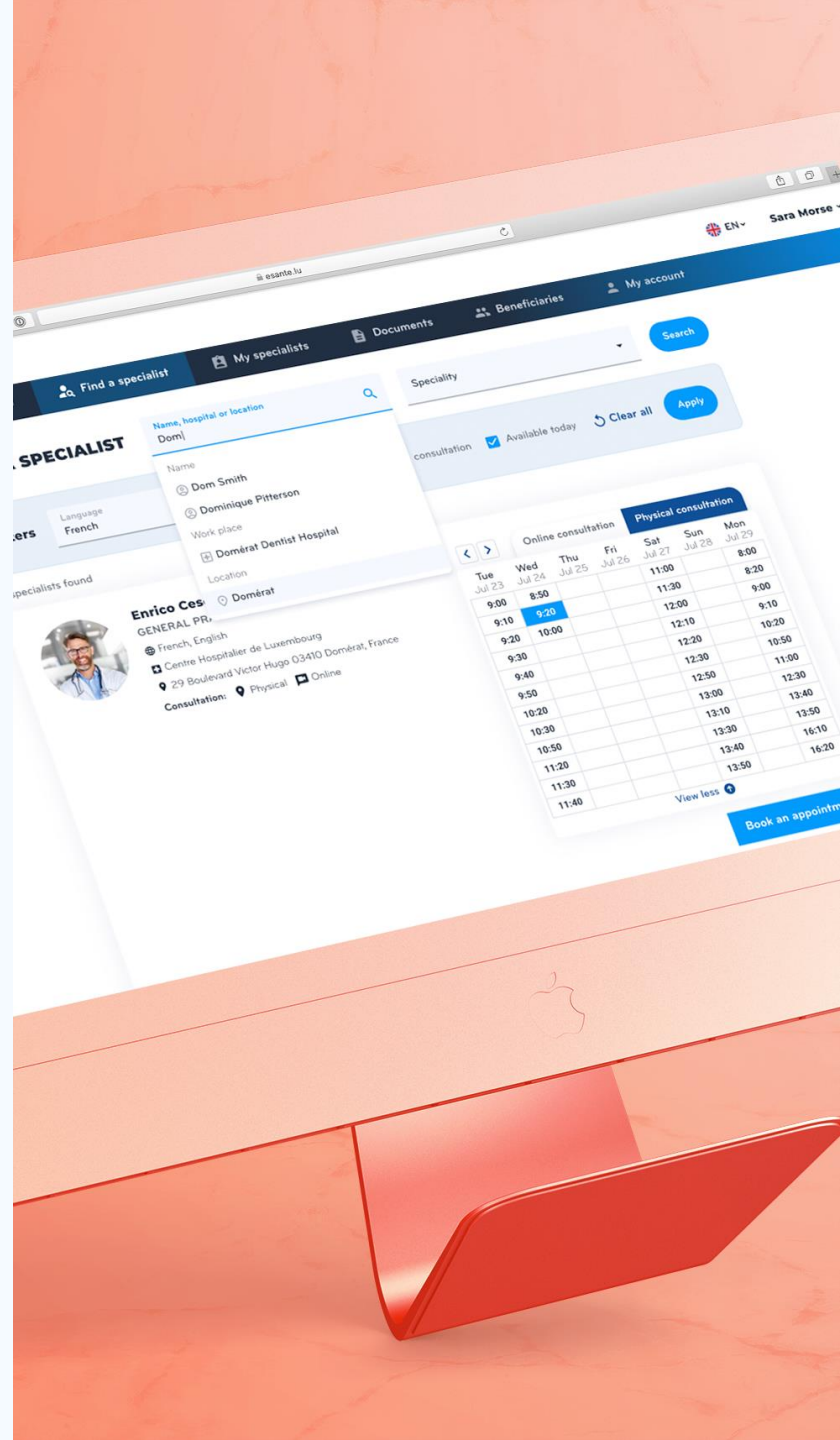


What was the task?

The eSanté eHealth agency commissioned technical contractors, Gcore and the Wagner Group, to develop a web application using a self-written CMS that could securely and intuitively schedule and support audio and video patient consultations for physicians and other professionals based on a dedicated calendar.

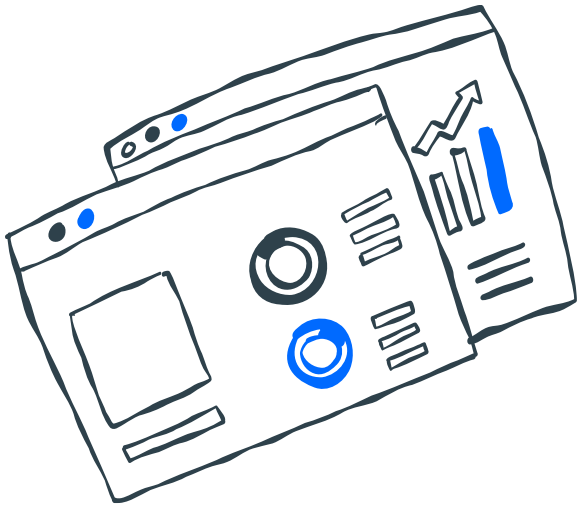




Requirements for the web application

The communication between doctors and patients had to have enhanced protection, and the information had to be stored on a dedicated and fully redundant servers hosted in Luxembourg. The telemedicine service needed to be a cross-platform solution that patients run in a browser, without the need to download third-party apps.

At the same time, the entire medical history of patients had to remain confidential and be stored in patient cards, with their data located strictly within the eConsult platform.



Four important additional features

1. A built-in prescription tool for doctors.
2. The ability to securely exchange medical records and test results with patients.
3. Compatibility with all popular operating systems and devices, including smartphones, tablets, and laptops.
4. A dedicated nurse catering module for “home nursing” organizations.

eConsult app creation: technologies and features

WebRTC. Video calls in eConsult are implemented on the WebRTC real-time video transmission technology, which minimizes the delay to a maximum of 1 second.

Browser support. The application works in the following modern browsers: Chrome 70+, Safari 12+, Firefox 70+, Opera 60+. The video feature is available on computers, mobile phones, and tablets.

SFU. For communication between doctors and patients, the SFU (Selective Forwarding Unit) method is used, which allows the exchange of data through the server. All communication is encrypted. The SRTP protocol is enabled, which allows secure transmission of data in real time.

Operation via VPN. Video calls work even in corporate networks with strict security rules, where access to the network is provided via a VPN or where most of the non-standard ports are closed.

Simulcast streaming. For video transmission, the Simulcast Streaming technology is used for adaptive delivery of a video stream to all participants in a video call, so high-quality broadcasts can be provided, even with an unstable internet connection. The server accepts multiple media streams and then decides which of these streams should be sent to each of the participants, depending on their personal bandwidth, in real time. This happens dynamically to ensure the quality of the video conferencing.

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Project stages

1. Improving the old system and preparing it for the transition to the new one
2. Creating the MVP of the new platform
3. Releasing the first version of the new platform — functionality for doctors and patients
4. Creating the administration platform
5. Releasing the second version of the new platform — functionality for nurses
6. Business analytics of new features
7. Creating the mobile application Soon — functionality for patients
8. Creating the mobile application Soon — functionality for nurses

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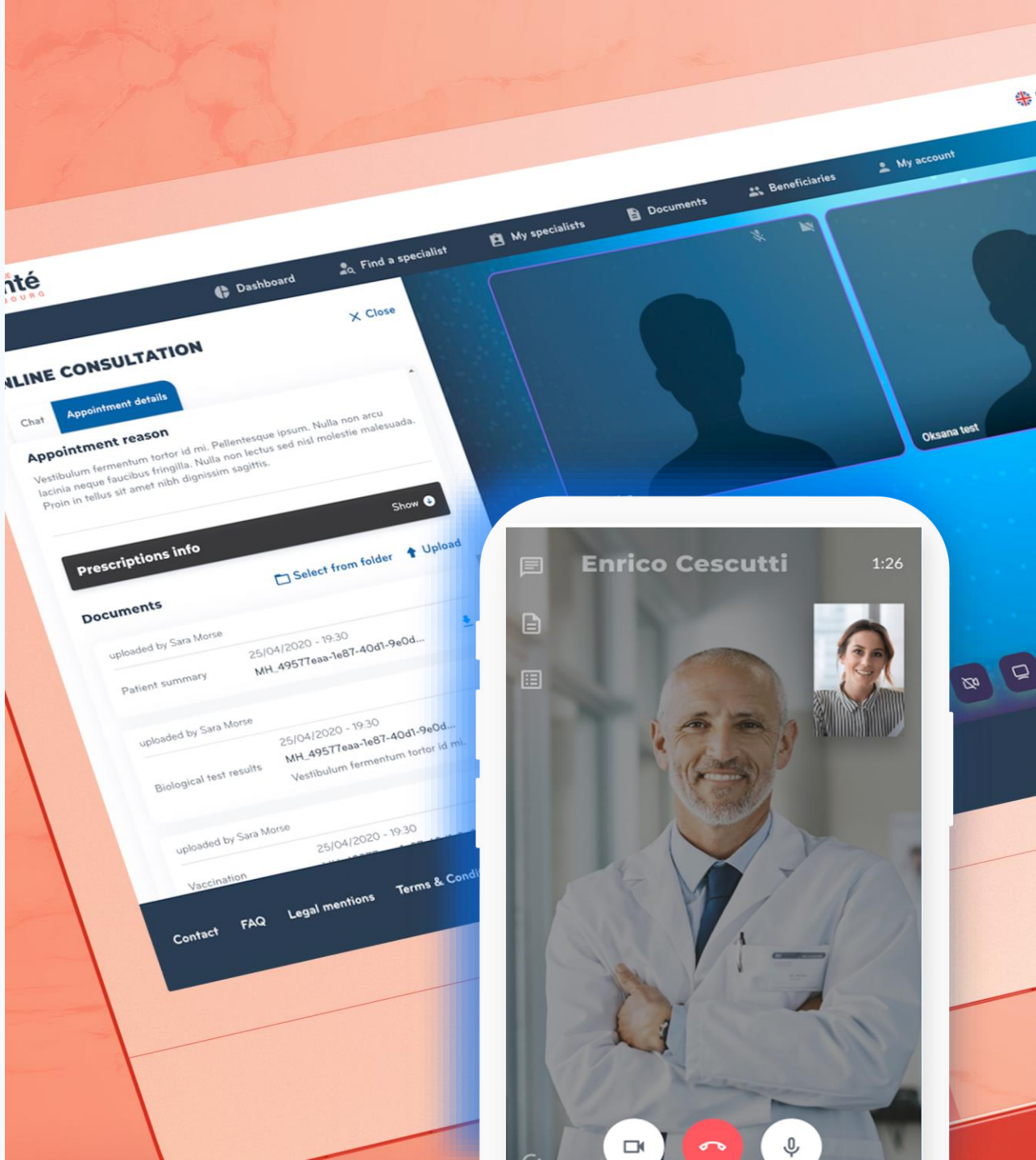
Results

What solutions made it possible to speed up development?

To reduce the budget and the time spent on creating the application, we offered to integrate our own solution — a successfully functioning service of video calls and video conferencing.

We call it **Gcore Meet**.

The eConsult telemedicine platform was developed and launched in a record six months. It’s physically located in a dedicated public cloud infrastructure specially designed for the Wagner Group by Gcore Cloud and situated in the EDH Tier IV data center in Luxembourg.



Collaboration with Intel

After developing and launching the eConsult telemedicine platform for the Grand Duchy of Luxembourg in 2021, the two companies started a new project with Curamedon.

The telemedicine application has been tested on the 21.09 version of **Intel® Smart Edge Open for Developers**, a royalty free edge-native computing software toolkit that enables highly optimized and performant edge platforms to on-board and manage applications and network functions with cloud-like agility across any type of network. Furthermore, Intel® Xeon® processors are also used to run servers while handling gigantic amounts of data and providing Error Correcting Code (ECC) support to prevent servers from crashing.

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Telemed Cloud components

- Intel® Xeon® Processors
- Cloud PoPs with Intel SGX®: Luxembourg, Manassas (USA), Johannesburg (Africa)
- 3rd Gen Intel® Xeon® Scalable Processors

With the release of the 2nd Gen Intel® Xeon® Scalable processors, we have fully switched to using them in our projects to upgrade the company's infrastructure.

For example, now we're using **Intel® Xeon® Gold 5220R** processors for virtualization servers, as this model, in our opinion, offers the most optimal price-to-core ratio. For hosting products, the R-line processors offer better performance than the previous line of processors for the same price.

Also, the use of CPUs from the new Intel line allowed us to increase the performance of Gcore CDN caching servers.

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Intel® Network Builders: collaboration for end-user and client

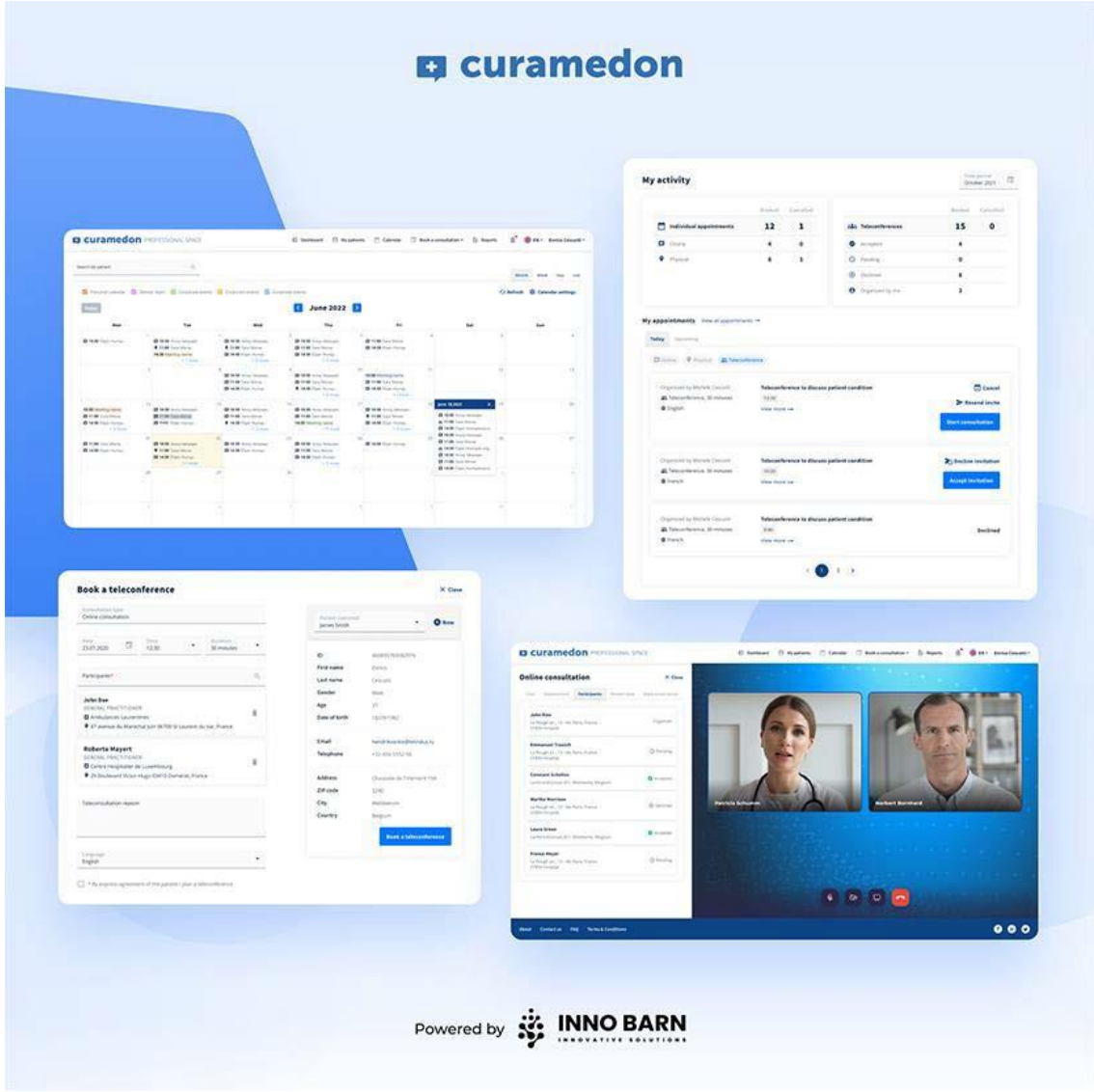
Curamedon Chat

Chat application embedded into telemedicine software provides a possibility to exchange text messages and media files in real-time, keeping all the message history encrypted. Such a service provides a user-friendly and secure interface for direct communication with health care specialists.

Curamedon Uploads

Being a part of telemedicine software, Uploads application is designed as a robust solution for exchanging media files between patients and health care professionals.

Resumable file uploads are provided by tus protocol. File encryption is S3 storage and secure authentication mechanism with a built-in 2FA feature to prevent non-authorized access to uploaded documents.



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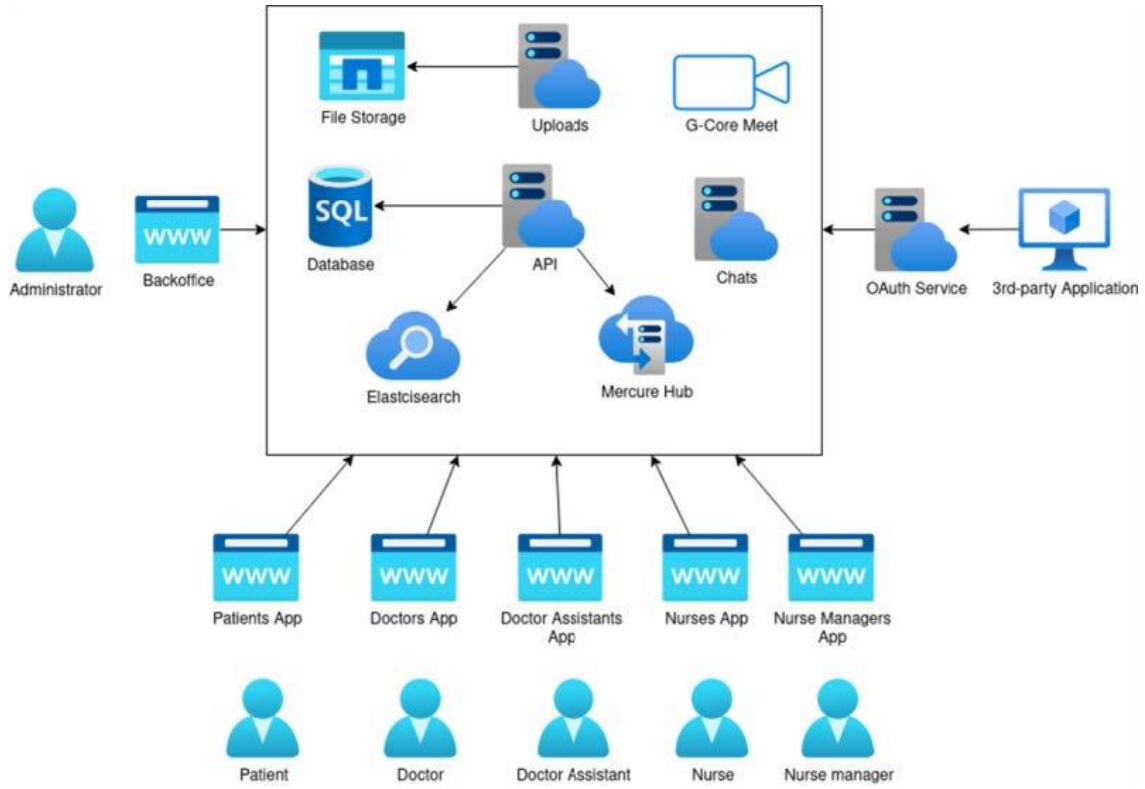
Integrations

Our API enables integration with any already functioning medical system, CRM, or planning system, which allows us to expand the range of services provided by any medical clinic.

Curamedon ecosystem contains 6 applications:

1. Back-office app
2. Patient app
3. Doctor app
4. Doctor’s assistant app
5. Nurse app
6. Nurses’ manager app

We support integrations with any governmental or commercial services.



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What’s next

Integration with medical and wearable devices that read medical parameters, processing data from devices for making emergency decisions, generating analytical reports and dashboards for doctors.

Payment system for accepting online payments from patient to doctor.

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We are open to collaboration and partnership

Expand on existing use cases, please contact us in case you see more opportunities, or you would like to try teleconsulting in other industries such as Law, Education, Architecture, White and Yellow papers, or any other.

Ask for a demo or let's discuss integration with your digital ecosystem

sales@innobarn.com
sales@curamedon.com

Thank you

Curamedon. Conduct more medical consultations remotely

Developed in Luxembourg by Gcore and Wagner Group in 2021—2022

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