

Coronavirus UY App: Behind the Screens

Now that the second stage of the [Coronavirus UY](#) application is live, I'd like to tell you the story behind the app of Uruguay's Coronavirus Plan, and maybe give you a glimpse of why this app is considered unique in the world.

A short introduction to the app: Coronavirus UY provides a secure method of self-assessment for COVID_19 without overloading phone lines and avoiding the movement of people, in order to improve care for those who suspect they have COVID-19. Also, it now offers new features such as drive-through testing and telemedicine for patients who tested positive. The system, which has already been downloaded by more than 250,000 users, optimizes communication between citizens and health services by assisting those who require a medical evaluation. A recent update incorporates the following features:

- Official data chart
- Telemedicine (remote monitoring of patients by doctors, including the use of video calls, biosecurity)
- New Clinical Follow-up Inbox for care providers
- Drive-through testing (people can get tested at a testing site without getting off their cars, biosecurity)

All right, let's now go "behind the screens" :)

(The images in this article are for information purposes only. The objective is to illustrate ideas and no real data or final implementations are displayed.)



Plan Nacional Coronavirus

COVID-19



Juan Andrés Gonzalez

1.234.567-8

🕒 En seguimiento



29 Marzo - 12.15

Paciente en seguimiento clínico recomendado

Su Prestador de Salud ha indicado hacer seguimiento de su caso.

Se requiere que haga un reporte de síntomas un mínimo de dos veces por día.

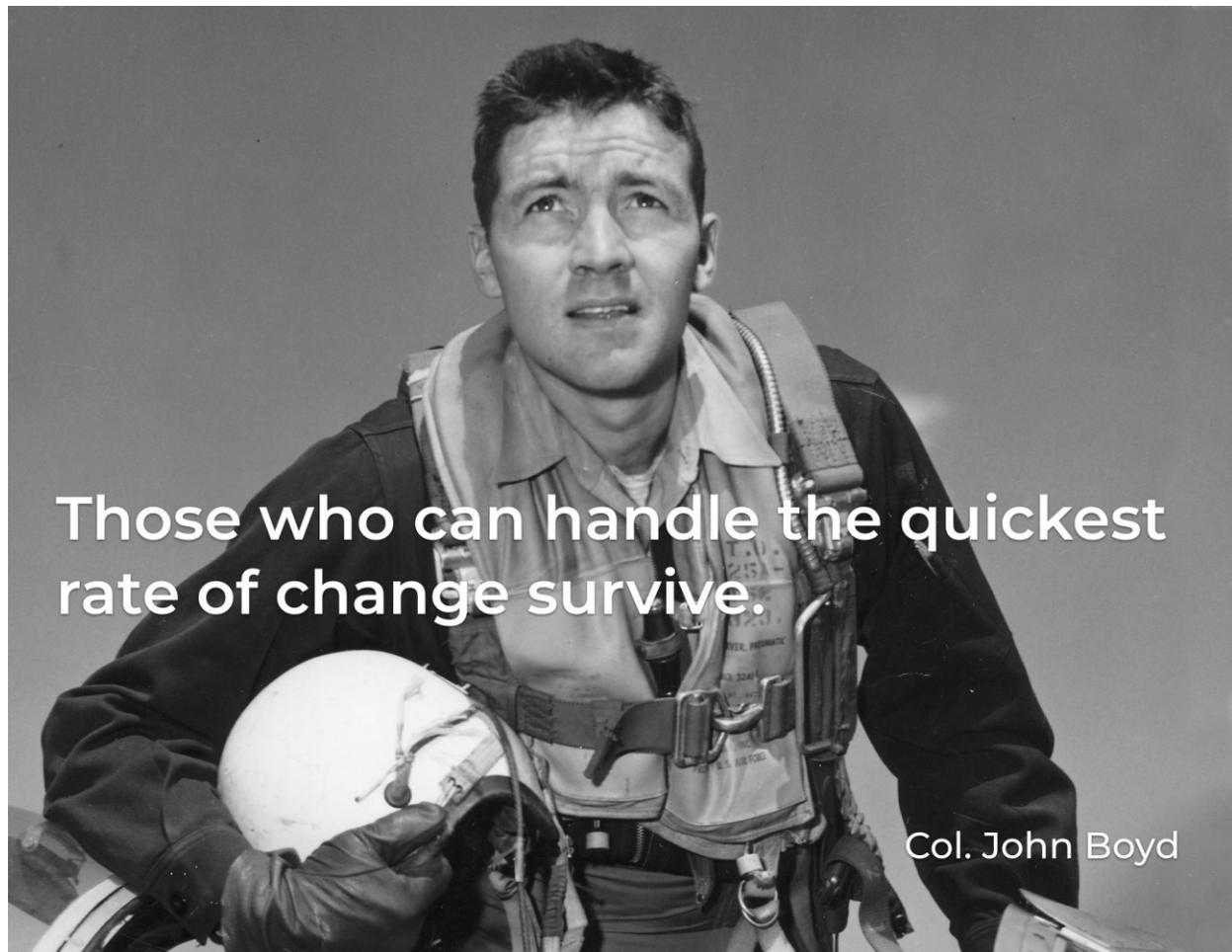
Auto monitoreo

Usted aún no ha enviado reportes de estado a su Prestador de Salud. Se requiere que lo haga al menos dos veces al día.

[Reportar mi estado ahora](#)

As we all have known for some time, the world is currently experiencing total uncertainty.

According to U.S. Air Force Colonel John Boyd, priorities should be *people first, ideas second, and things third*. In other words, in order to achieve success in the midst of uncertainty, first we need to worry about what people we have, then what ideas we have, and only thirdly what tools we will use to go to war.



People

So, let's start by focusing first on those who interacted with the project, within different companies and from different backgrounds. Some of them got involved in the early stages, and others later on. Also, there are probably many more, but here is a list of those I know are working on this (please excuse any omissions):

Uruguay's Presidency, Salud.uy, AGESIC (Agency for Electronic Government and Information and Knowledge Society), MSP (Ministry of Public Health), SINAIE (National Emergency System), Claro, ANTEL (state-owned telecommunications company), ITC, HG, BPS (social security institution), Health care providers, ASSE (public health provider), HCEN (National Electronic Health Record), Accesa, Quanam, Tryolabs, CUTI (Uruguayan Chamber of Information Technology), Sibel, Abstracta, Qualified, DVelop, I+Dev, Concepto, GeneXus Consulting, Globant, Deaf Health Unit, "Tiraparedes" Health Clinic, BigCheese, InSwitch, IxDA, Dilis, ICA, Google, Apple, Facebook, BlazeMeter, Sinch, GeneXus.

Naming individuals would be a never-ending list of people who have contributed their work and ideas, and that's why I simply point to Laura Aguiar as one of those great examples of civic responsibility for this cause. In addition to Laura there are many others, but it would be too long and perhaps unfair to mention just a few in this article.

Ideas

Regarding ideas, there is not much innovation. It turned out to be a combination of ideas from China and South Korea, which have been used to start building the app and were later adapted to Uruguay's reality in record time. Almost all companies had the same ideas about what the solution to the problem we faced would look like; the challenge was how to build it quickly.

- Centralize requests so as to measure risks, enable patient triage, and then distribute and take different types of actions.
- Make it possible to connect the virtual world with the physical world of tests.
- Allow for mass triage and then follow up symptoms remotely.
- Reduce demand for call center services of health care providers.
- Quickly provide some kind of response to the population to address their concerns.

We can say the app is adapted to Uruguay and its health stakeholders. This adaptation includes, among other things, interconnection with all health stakeholders, provision of telemedicine, and design with multi-channel and accessibility in mind.

The official strategy can be accessed in the following link (in Spanish):

<https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-conocimiento/comunicacion/noticias/estrategia-digital-frente-covid-19>

Tools (and Processes)

As for requests, it was decided that the input queue would be centralized using a multi-channel strategy. Thus, the first stage of information registration was implemented in 7 days through the following channels (the visible part of the project):

- Call centers (Web form)
- Web Chatbot
- Instant Messaging (WhatsApp, Messenger)
- WebApp (Progressive Web Application)
- Native Apps (Android and iOS)

Vías de contacto



0800 1919

Servicio de información del Coronavirus



Whatsapp 098 99 99 99

Nuevo canal de comunicación para evacuar consultas



Chatbot ¿Dudas sobre Coronavirus?

Accediendo en el botón azul de abajo a la derecha



Aplicación móvil Android

Descargable desde la playstore oficial



Aplicación móvil IOS

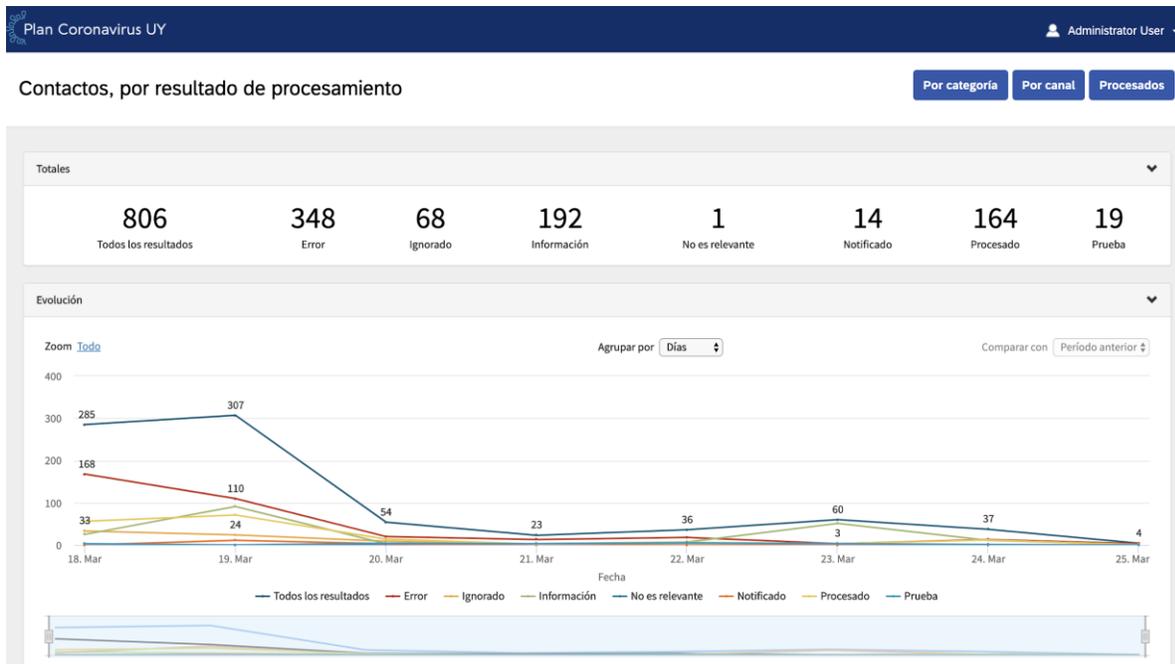
Descargable desde la App Store



Messenger @MSPUruguay

Nuevo canal de comunicación

What data is coming in? Of what quality is it? Data quality groups were created to make an initial analysis of this information and thus enter the system.

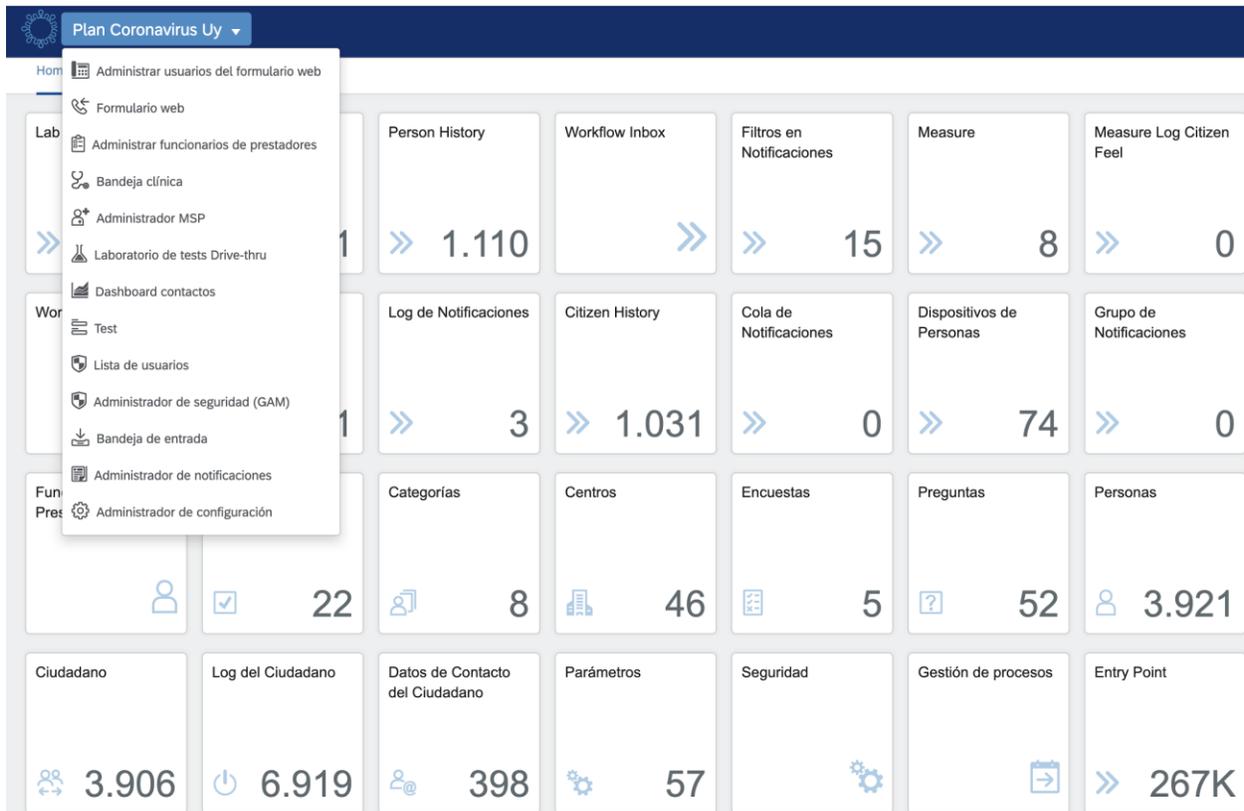


OK, but enter where? The invisible –or less visible to users– part of the Project:

--> A risk monitoring system for COVID-19 or, in the future, for other diseases.

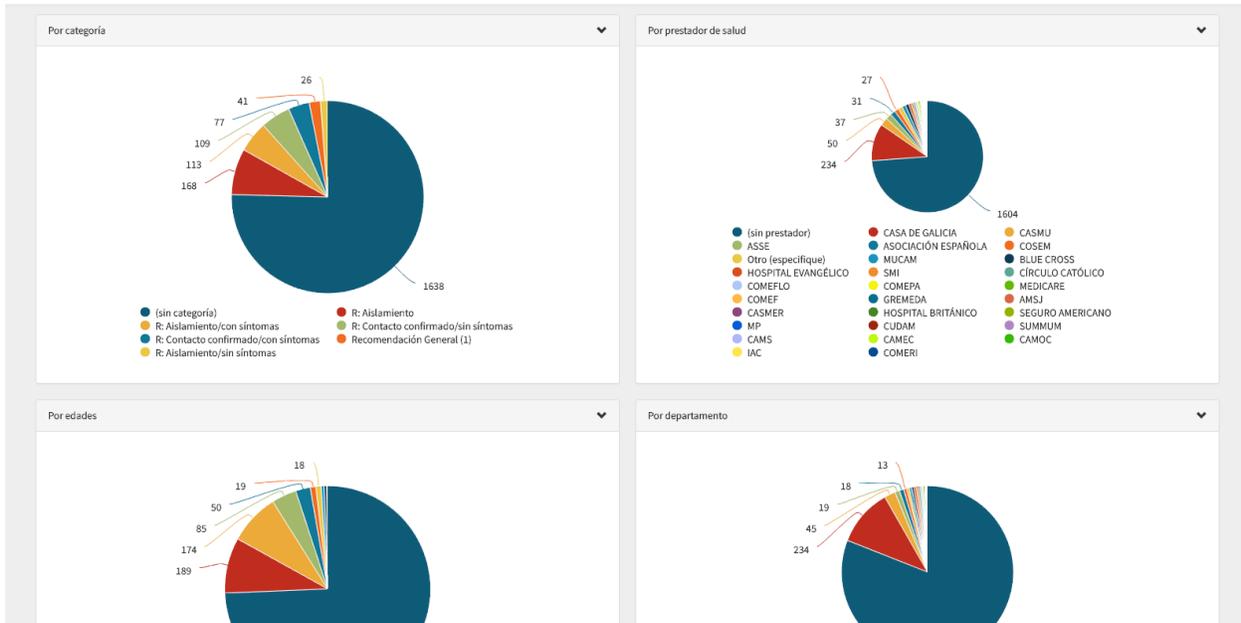
The system, which was developed from scratch, now has more than 80 tables and more than 20 modules, including a risk module and a monitoring module, both of which were put into operation in the second week of work.

Another detail is that this system must have a web interface and decision-making dashboards. Obviously, it must be able to interoperate with all state systems: Ministry of Public Health, National Emergency System, Clinical Records, and more.



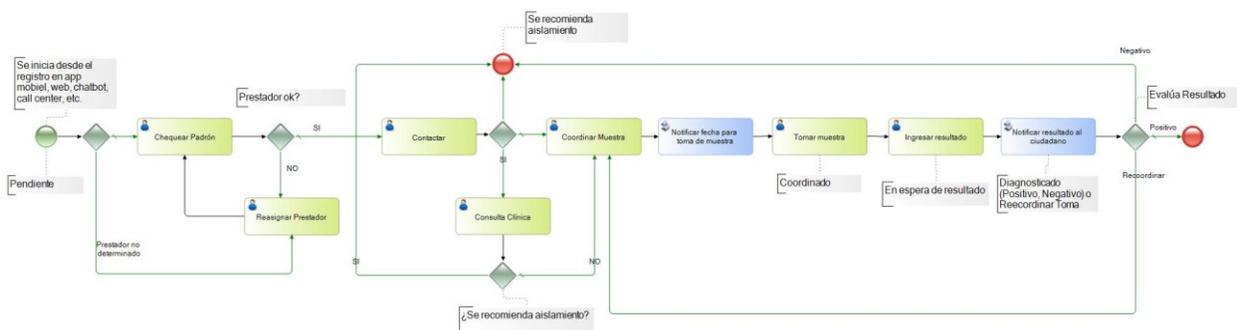


Contactos procesados por bandeja de entrada



Now, suppose that a user was able to enter the system after the initial quality analysis.

What do we do with this information? This is changing all the time, so what is working in the background is a workflow engine that distributes cases to each health care provider's inbox.



In this inbox, staff from health care providers start the contact workflow and eventually distribute tasks to clinical inboxes handled by physicians.

Bandeja de Entrada - N° CASOS: 9

Tareas Pendientes									
Cat. Entrada	Cat. Salida	Nombre	Edad	Documento	Departamento	Tarea	Ingreso	Actualizado	
CONTACTO	R: AISLAMIENTO/CON SINTOMAS	LUCAS VIATRI GARCIA	52	12345678	MONTEVIDEO	Chequear Padrón	04/04/20	04/04/20	Tomar Acción
SINTOMAS	R: AISLAMIENTO/CON SINTOMAS	JULIA GOMEZ	75	99977788	MONTEVIDEO	Chequear Padrón	04/04/20	04/04/20	Tomar Acción
CONTACTO	R: AISLAMIENTO/CON SINTOMAS	LUCÍA GARCÍA	36	58987676	MONTEVIDEO	Chequear Padrón	04/04/20	04/04/20	Tomar Acción
VIAJÓ	R: AISLAMIENTO/CON SINTOMAS	VICTORIA GARCÍA	12	56911590	MONTEVIDEO	Chequear Padrón	04/04/20	04/04/20	Tomar Acción
CONTACTO	R: AISLAMIENTO/CON SINTOMAS	JOSE LUIS LARRATEA	50	38663123	MONTEVIDEO	Chequear Padrón	04/04/20	04/04/20	Tomar Acción
CONTACTO	R: CONTACTO CONFIRMADO/SIN SINTOMAS	NEGRO ECHAGUE	48	34864155	MONTEVIDEO	Chequear Padrón	04/04/20	04/04/20	Tomar Acción
VIAJÓ	R: AISLAMIENTO/SIN SINTOMAS	FACUNDO GONZALEZ	20	34222313	MONTEVIDEO	Chequear Padrón	04/04/20	04/04/20	Tomar Acción
VIAJÓ	R: AISLAMIENTO/SIN SINTOMAS	CARLOS PAZ MENDEZ	25	33553634	MONTEVIDEO	Chequear Padrón	04/04/20	04/04/20	Tomar Acción
VIAJÓ	R: AISLAMIENTO/CON SINTOMAS	FLORENCIA RODRIGUEZ	66	59337808	MONTEVIDEO	Chequear Padrón	04/04/20	04/04/20	Tomar Acción

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Doctors have their own inbox where users are classified by risk level according to criteria defined by epidemiologists. This inbox is used in a web browser and must be able to work on any Android device, such as those owned by ASSE –the public health provider– so that doctors can use it from any location.

Bandeja Clínica de seguimiento de casos

Reiniciar filtros

Abrir Sala de Teleconsulta

Personas en seguimiento									
Nombre	Documento	Edad	Sexo	Actividad	Lugar	Estado	Condiciones/Comorb.	Síntomas	
Manuel Perez	45556667	66	Femenino	Bombero	🏠	Espera de Test	Si	Hace 8 días	Tomar Acción
Julia Gomez	99977788	75	Masculino	Militar	🏠	Espera de Test	Si	Hace 30 días	Tomar Acción
Eugenio García	39883221	44	Femenino	Personal de la Salud	🏠	Test Positivo	No	Jue 15:10	Tomar Acción
Casmu	50987653	33	Femenino	Personal de la Salud	🏠	Test Positivo	Si	Ayer 16:00	Tomar Acción
Lucia García	58987676	36	Masculino	Policia	🇺🇾	Sin Test	No	Jue 21:24	Tomar Acción
Victoria García	56911590	12	Masculino		🏠	Espera de Test	No	Lun 16:25	Tomar Acción
Test User	12345673	23	Femenino		🇺🇾	Sin Test	No	Hace 8 días	Tomar Acción
Usuario Cosem	98637623	55	Femenino		🏠	Espera de Test	No	Ayer 16:25	Tomar Acción

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Telemedicine: How do doctors interact with patients?

Once again, it's the same concept as for data input: multi-channel.

The idea is that you can interact over the phone or video call (if the conversation was started directly through the app). For patients with hearing impairment, a sign language interpreter service in real-time ([DiLS](#)) is being considered as an additional communication option.

Plan Coronavirus Uy Usuario COSEM

Juan Pérez Dar de alta Testear Internar Llamar Disparar teleconsulta

Nombre y apellido Juan Pérez	Número de cédula 1.234.567-8	Edad 64	Teléfono de contacto 099 123 456
Nacionalidad Uruguayo	Correo electrónico juanperez@gmail.com	Departamento de residencia Canelones	Prestador de Salud CASMU
Género Masculino	Dirección Av. 18 de J		Método de registro App Coronavirus UV Android

Llamada telefónica a paciente

El teléfono de contacto del paciente a quien desea llamar es el siguiente:

099 123 456

Logré contactarme con el paciente No logré contactarme con el paciente

Evolución

Fiebre

Evolución del 10/03/2020 al 13/03/2020

° Temperatura

Fecha	Temperatura
10/03/2020	37.4
11/03/2020	37.8
12/03/2020	38.4
13/03/2020	38.6

Resfrío

Evolución del 10/03/2020 al 13/03/2020

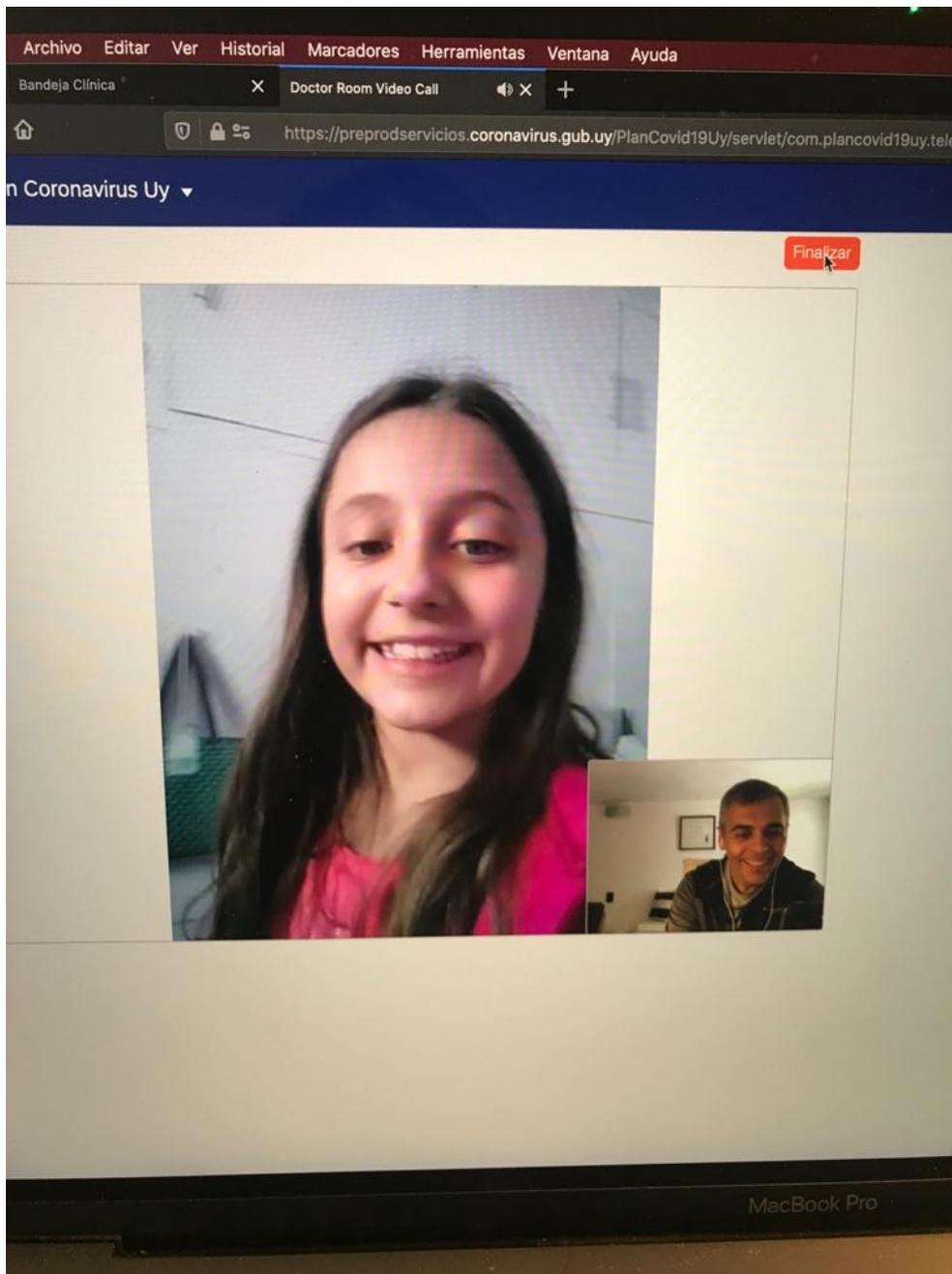
Persistencia del resfrío

Fecha	Persistencia
10/03/2020	1.5
11/03/2020	2.0
12/03/2020	2.5
13/03/2020	3.5

Fecha del registro	Hora del registro	Valor registrado
10/03/2020	09:32	37.8
11/03/2020	15:48	38.4
12/03/2020	11:04	38.9
12/03/2020	08:17	38.6

Dolor de garganta

Fecha del registro	Hora del registro	Valor registrado
10/03/2020	09:32	En aumento
11/03/2020	15:48	En aumento



Accessibility has always been a priority from a technical point of view. This implies that every new development, such as the web application, is fully accessible. Work is under way to incorporate sign language to make further progress in this area.



Accessibility

These checks highlight opportunities to [improve the accessibility of your web app](#). Only a subset of accessibility issues can be automatically detected so manual testing is also encouraged.

Additional items to manually check (11) — These items address areas which an automated testing tool cannot cover. ▼
Learn more in our guide on [conducting an accessibility review](#).

Passed audits (10) ▼

Not applicable (25) ▼



What about interaction with the patient?

As in any other consultation, decisions are made by the doctor or health care professional. In other words, the app provides guidance and the health staff decides what to do.

What happens if a test is ordered?

As in the previous cases, the system can manage a queue of tests to be started according to the availability of drive-through testing sites, which connects us to the physical world. This also had to be prototyped and specific modules for that process had to be created in the system.



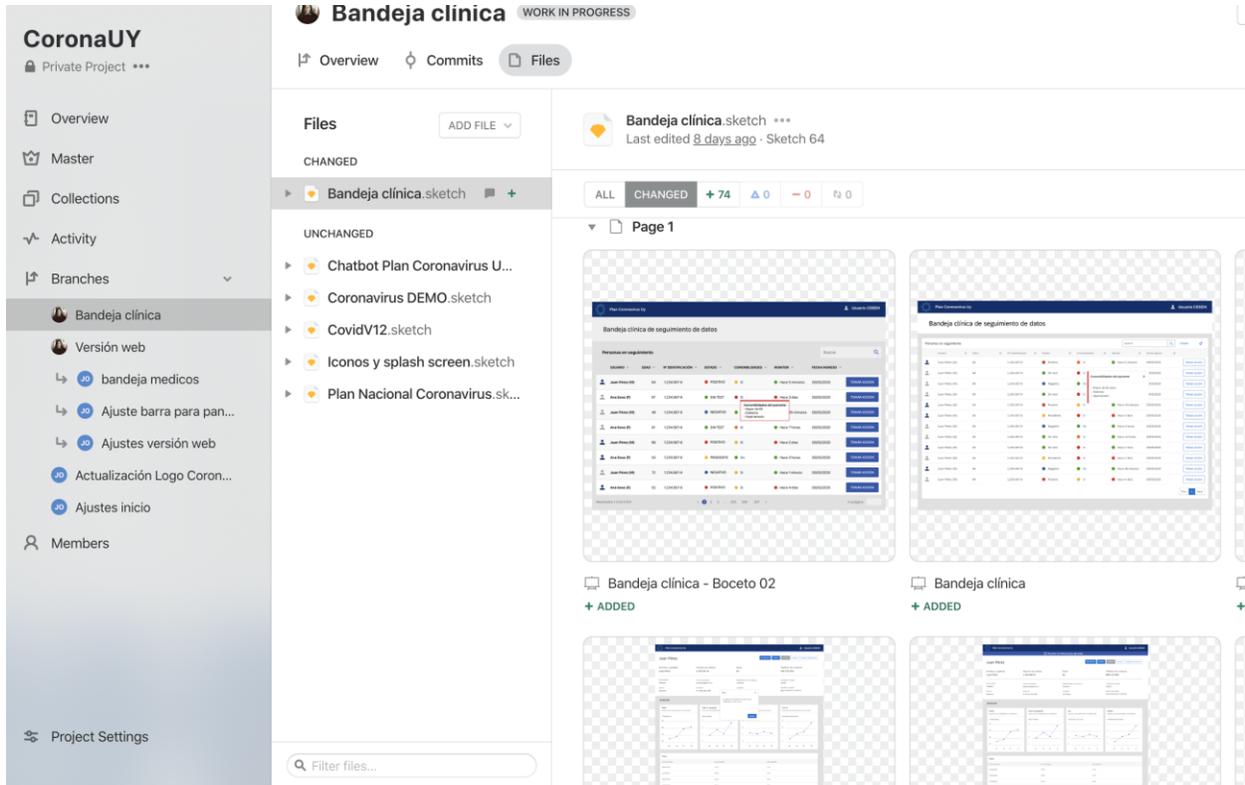
Development process and more

So far, we've followed a functional cycle. What about non-functional aspects? What can be said about the process? What infrastructure is used?

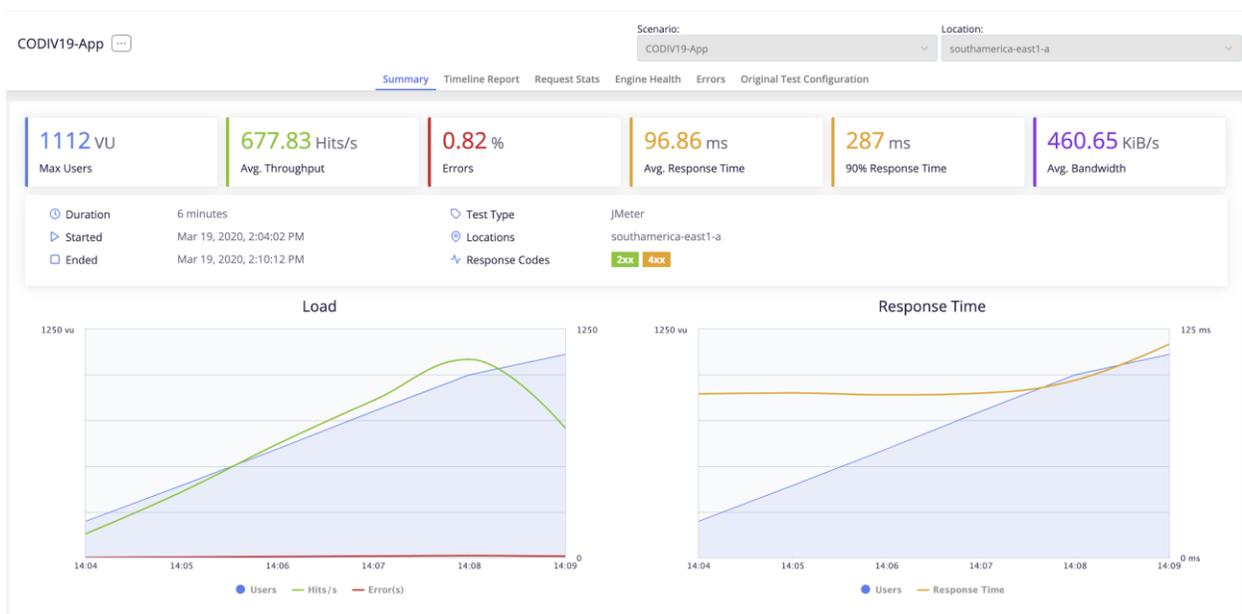
An impressive computer security team is committed to ensuring that the data and the system are secure. Although I may not be the right person to list everything that's been done here, I must say it's amazing: Infrastructure Security, Communications Security, Access Modeling, and System Permissions.

In addition, several UX teams are working on aspects related to design and interactions (Globant, IxDA, GeneXus Consulting, and individual people).

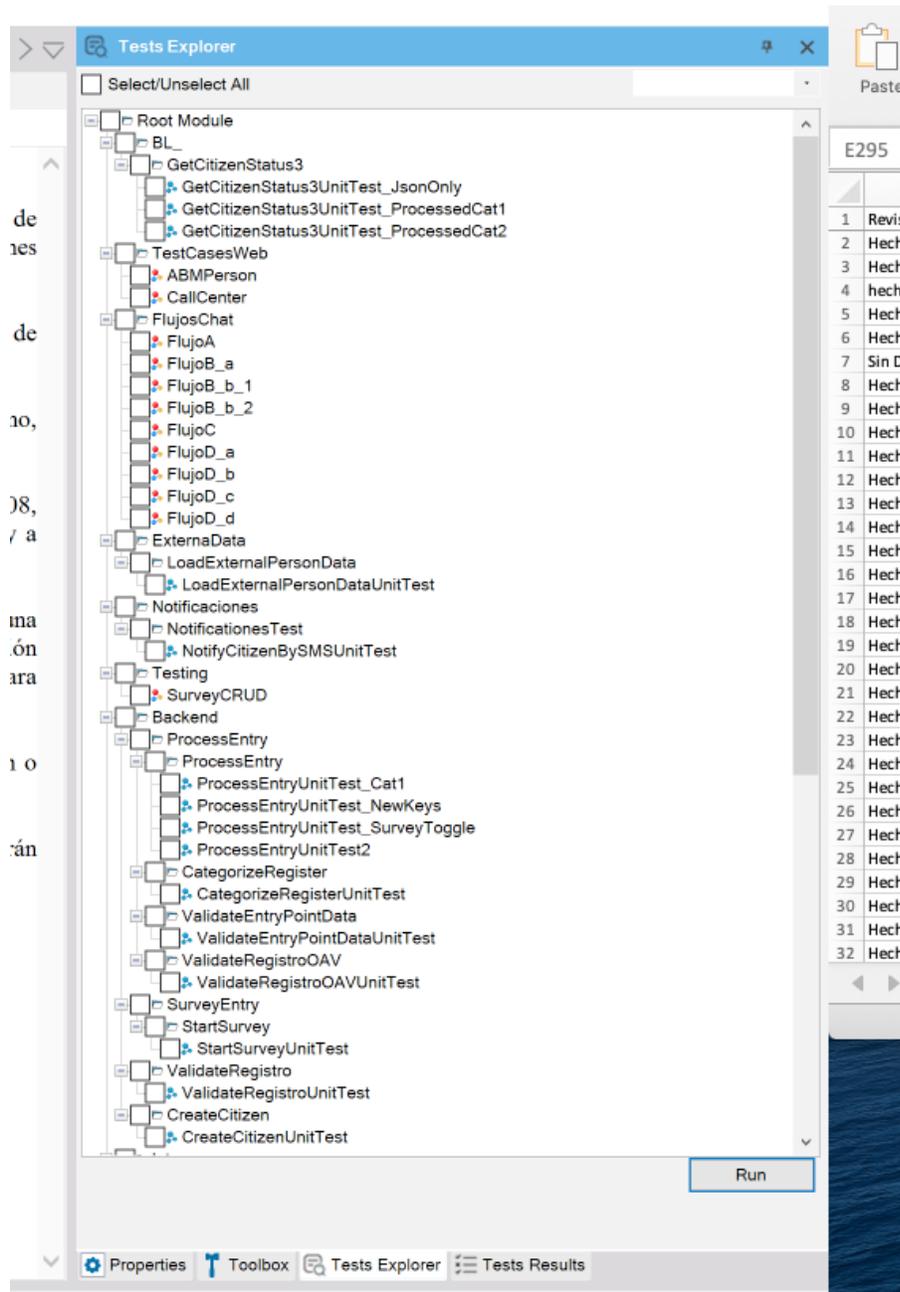
The team worked and iterated in the areas of Information Architecture, Interaction Design, and Visual Design. Various levels of prototype accuracy were achieved at high speed up to the functional prototype in GeneXus.



Performance Tests: the entire team at Abstracta has been fully committed to this task from the beginning. Everything put into production has been tested using BlazeMeter and other tools.



Countless Unit Tests were programmed by different people.



Functional tests were also made and several companies worked in this area: Qualified, Abstracta, Health care providers, Accesa, GeneXus, among other volunteer testers (including my dear wife, Nati!).

A	B	C	D	E	F	G
		I1	I2	I3	I4	I5
Resumen		Usuario sin seguimiento / sin test positivo / App recién instalada	Usuario sin seguimiento / sin test positivo / App YA instalada	Usuario en seguimiento / App recién instalada	Usuario en seguimiento / App YA instalada	Usuario positivo / en seguimiento / App recién instalada
App instalada	Si		x		x	
	No	x		x		x
Estado paciente	Positivo					x
	En seguimiento			x	x	
	Sin seguimiento	x	x			
Precondición		En el back-end NO se encuentra el registro de esa CI	En el back-end se encuentra el registro de esa CI	En el back-end ya se encuentra el registro de esa CI indicando que está en seguimiento	En el back-end ya se encuentra el registro de esa CI indicando que está en seguimiento	En el back-end ya se encuentra el registro de esa CI indicando que es positivo
Resultado esperado		Igual que la v1. En ningún lugar debe pedir código de acceso	Igual que la v1. En ningún lugar debe aparecer un login	Usuario debe ingresar sus datos, y luego debe pedir código de acceso	En Home ve que está en seguimiento. En Mi Estado debe pedir código de acceso	Usuario en Home ve opciones y debe registrar sus datos. Luego debe pedir código de acceso
		STOPPER	STOPPER		STOPPER	

What about the development cycle?

The security team monitored the app's secure development. A great team of continuous integration currently includes 5 pipelines, trunk, testing, AWS testing, pre-prod ANTEL, prod ANTEL.

For ANTEL environments in particular, automation tools were created: deployment to various WebApps, patches, process execution, reorganizations, queries, etc. Even if we're still far from AWS, a first step has been taken.

...-accesos02:/var/gx — ssh ◀ msp-access.sh

...msp-accesos02:~ — ssh ◀ msp-access.sh

~~~~~  
P R E - P R O D U C T I O N  
~~~~~

1. Deploy Process Server Only
2. Deploy All Servers

reorg_pre. Execute Rerogs

~~~~~  
P R O D U C T I O N  
~~~~~

3. Deploy Process Server
4. Deploy All Servers
5. Restore last deploy Process only
6. Restore last deploy all

~~~~~  
R E O R G S  
~~~~~

9. Send Reorgs to servers (no execution here)
10. Execute Rerog in Pre-Prod
11. Execute Reorg in Production

7. Exit

[Enter choice [1 - 7] 7

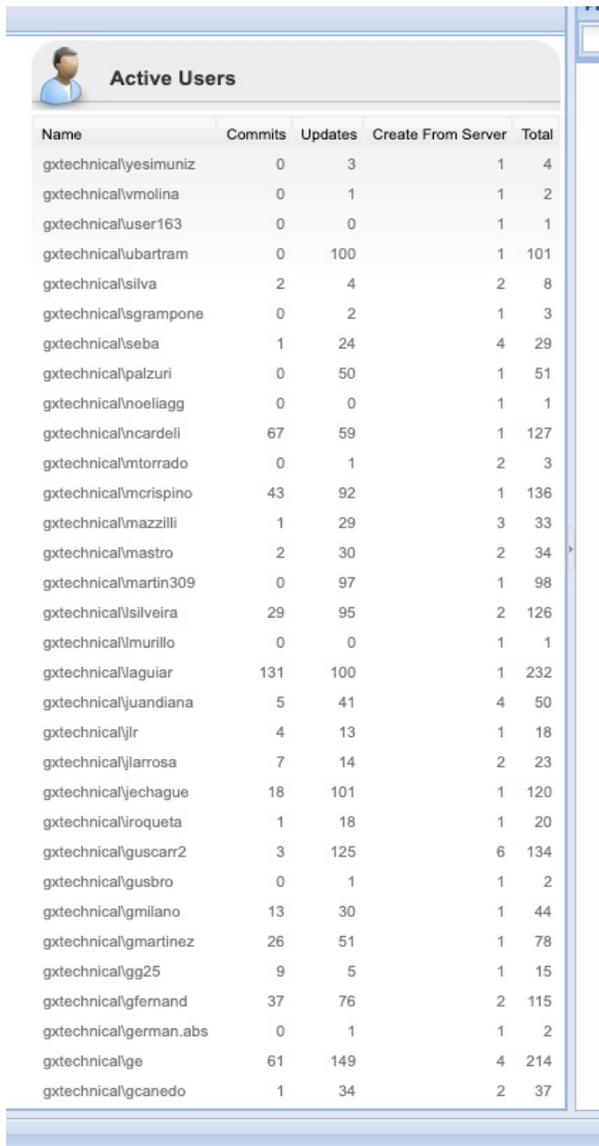
[root@msp-accesos02 gx]# █

NAME	HEALTH
Deprecated - PlanCovidUy AWS	
Deprecated - PlanCovidUY Java	
MyDoctor	
MyDoctorP	
Pipeline Testing	
PlanCovidUy Promoting	
PlanCovidUy Stable	
PlanCovidUY Testing	
Update GX CoronaTrunk	
Update GXserver	

Run Disable

STATUS	RUN	COMMIT	MESSAGE	DURATION	COMPLETED	
	108	-	Started by user Bob The Builder	7m 44s	12 minutes ago	
	107	-	Stable #1684	2 commits 14m 4s	22 minutes ago	
	106	-	Stable #1672	36m 56s	4 hours ago	
	105	-	Changes to move InputLaboratoryTestCmd as patch, to run in Prod (... 2 commits)	36m 6s	5 hours ago	
	104	-	Started by user Bob The Builder	2m 14s	18 hours ago	
	103	-	Stable #1635	30m 22s	20 hours ago	
	102	-	Started by user Bob The Builder	35s	21 hours ago	
	101	-	Stable #1612	32m 20s	a day ago	
	100	-	Stable #1605	2 commits 8m 14s	a day ago	
	99	-	Stable #1597	46m 12s	a day ago	
	98	-	Stable #1589	52m 40s	a day ago	
	97	-	Stable #1579	3 commits 4m 57s	a day ago	

The development of the system's core involved 42 people with more than 2,000 commits to date, in 3 weeks of development work.



Active Users				
Name	Commits	Updates	Create From Server	Total
gxtechnical\yesimuniz	0	3	1	4
gxtechnical\vmolina	0	1	1	2
gxtechnical\user163	0	0	1	1
gxtechnical\ubartram	0	100	1	101
gxtechnical\silva	2	4	2	8
gxtechnical\sgrampone	0	2	1	3
gxtechnical\seba	1	24	4	29
gxtechnical\paizuri	0	50	1	51
gxtechnical\noeliagg	0	0	1	1
gxtechnical\ncardeli	67	59	1	127
gxtechnical\mtorrado	0	1	2	3
gxtechnical\mcrispino	43	92	1	136
gxtechnical\mazzilli	1	29	3	33
gxtechnical\mastro	2	30	2	34
gxtechnical\martin309	0	97	1	98
gxtechnical\silveira	29	95	2	126
gxtechnical\murillo	0	0	1	1
gxtechnical\laguiar	131	100	1	232
gxtechnical\juandiana	5	41	4	50
gxtechnical\jlr	4	13	1	18
gxtechnical\jlarrosa	7	14	2	23
gxtechnical\jehague	18	101	1	120
gxtechnical\iroqueta	1	18	1	20
gxtechnical\guscarr2	3	125	6	134
gxtechnical\gusburo	0	1	1	2
gxtechnical\gmilano	13	30	1	44
gxtechnical\gmartinez	26	51	1	78
gxtechnical\gg25	9	5	1	15
gxtechnical\gfermand	37	76	2	115
gxtechnical\german.abs	0	1	1	2
gxtechnical\ge	61	149	4	214
gxtechnical\gcanedo	1	34	2	37

PlanCovid19Uy  [Checkout](#)

[KB Dashboard](#) [Knowledge Base](#) [Documentation](#) [Versions](#) [Activity](#)

Knowledge Base



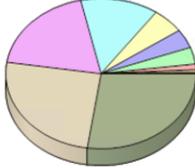
Name: **PlanCovid19Uy**
 Active Version: **PlanCovid19Uy**
 Collaboration Mode: **Merge**

Knowledge Base description is empty

Information [Size](#) [Schema Size](#) [Not Referenced Objects](#)

1079 Objects

- 295 Procedure (27.34%)
- 271 Web Panel (25.12%)
- 206 External Object (19.09%)
- 143 Structured Data Type (13.25%)
- 59 Data Provider (5.47%)
- 44 Transaction (4.08%)
- 39 Data Selector (3.61%)
- 13 Subtype Group (1.20%)



Latest Commits [See all](#)

#	Date	Comment	User
815	03/24/20 11:49 PM	No se esta asignando el estado en el output, y viene siempre 0	GeneXus Account\jjarrosa
814	03/24/20 11:05 PM	Fix image not showing on hdpi screens	GeneXus Account\incardelli
813	03/24/20 10:10 PM	Save on Measures and Health Reports	GeneXus Account\igmilano
812	03/24/20 09:57 PM	Cambios en el calculo	GeneXus Account\lge

Let me also mention those who have collaborated with this project, from giving words of encouragement or advice, to acts of kindness such as taking a monitor to your home or sending you something in an Uber. It has all added up and will continue to do so.

In addition, I want to thank all our families who have helped in the background by putting up with us working nonstop for more than 15 days.

This is the Coronavirus UY app.

Nicolás Jodal, who is introducing it in the media (on behalf of the private sector), has said that 150 people were involved in the project, which may seem a lot for an app. It seems like a lot, because at first we only see the app, but behind it there are complex requirements and systems interacting. To achieve this, many people had to work together ;)

If someone tells you that the app consists of 3 screens, it means that we have met the objective of hiding its complexity. If anyone has received a call, has been tested, or is being followed up thanks to the app, we will have achieved our real goal which is for technology to do its bit to help in this war.

To me, deep down, when someone talks about the app, they're talking about: People, Ideas, and Things... In that order!

Here are some backstage moments of this creation, where obviously everyone worked from home. One app, a thousand stories, a thousand laughs, a thousand discussions, and a single

goal. Today, in Uruguay's technical community we have more mutual respect for and confidence in each other than ever before.