3rd Regional Connectathon Technical Report

22 - 24 October

Bogotá, Colombia, 2024

Summary

Introduction

The 3rd regional connectathon, the PH4H Connectathon, took place from October 22 to 24, 2024, in Bogotá, Colombia, during the official launch of the Pan-American Highway for Digital Health (PH4H).

The PH4H is an initiative led by the Inter-American Development Bank (IDB), the Pan American Health Organization (PAHO), and countries in the region, aiming to enable connected health for all people by strengthening the interoperability of digital health systems.

Participating countries of the PH4H Connectathon, representing the ministries of Health from 18 regional countries.

Fig. 1: 2024 PH4H Connectathon Participating Cuntries

The 3rd connectathon took place as a result of the progress achieved in previous editions. The first connectathon, held in 2022 in Santiago, Chile, and the second one, in 2023, in São Paulo, Brazil, were key to consolidating collaboration in digital health within the Latin America and the Caribbean (LAC) region. Representatives from the ministries of Health of Argentina, Bahamas, Barbados, Belize, Bolivia[1], Brazil,

[1] Bolivia joined the event directly, skipping the pre-connectathon phase, so its participation is considered as a "soft tester." This means the country performed tests on the tracks without using the official evaluation platform. Therefore, this country is not included in the general statistics related to the completion of the defined tracks.

Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Panamá, Paraguay, Perú, Suriname, Uruguay, participated in the 2024 version of the event.

The 2024 connectathon testing sessions took place at the Hilton Bogotá Corferias Hotel. The connectathon was focused on strengthening the Pan American Highway for Digital Health (PH4H) and two tracks were tested

- **Track 1: Cross-border Continuity of Care**
- **Track 2: Digital Vaccination Certificates**

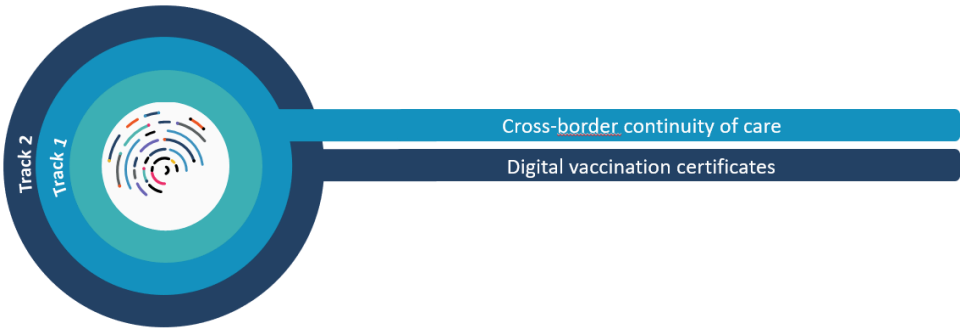


Fig. 2: 2024 PH4H Connectathon defined tracks.

Both tracks are aligned with international interoperability standards for digital health, focusing on continuity of care and vaccination certificates, respectively.

1. **Track 1: Cross-Border Continuity of Care:** This track aimed to enable participating countries to generate international clinical information summaries for individuals, based on a standardized dataset aligned with the IPS-LAC (International Patient Summary) international profile. These summaries were made accessible through Verifiable Health Links[2] (VHL), facilitating the secure and controlled exchange of health information between individuals and health systems. This approach optimized data mobility and promoted interoperability in the cross-border context.
2. **Track 2: Digital Vaccination Certificates:** This track focused on enabling participating countries to generate, interoperate, and validate immunization certificates using a standardized dataset based on the WHO's DVC profile. This approach ensured compliance with international standards and facilitated the seamless exchange of data across borders.

[2] **VHL (Verifiable Health Links):** The Verifiable Health Link is a digital tool that enables the secure and verifiable sharing of health information. This technology ensures that medical data is authentic, has not been altered, and can be easily validated by the individuals or institutions involved in its exchange. This facilitates patients in controlling and sharing their health information reliably, especially in cross-border healthcare scenarios.

Testing event 2024

The event was organized into two main phases: Pre-connectathon & connectathon testing.

Pre-connectathon

The three months prior to the event, a preparation phase called "Pre-connectathon" was conducted. This stage was developed around three main pillars: knowledge dissemination, platform development and deployment, and internal configuration and testing.

Each participating team was responsible for preparing and deploying the necessary public infrastructure to implement and test the interoperability standards and profiles defined for each track. Throughout this process, countries received continuous support and guidance from specialized technical experts.

Additionally, the technical teams were trained on key standards and profiles related to the defined tracks, addressing topics such as HL7 FHIR [3](Fast Health Interoperability Resources) IPS[4] (International Patient Summary) MHD[5] (Mobile Health Documents), VHL (Verifiable Health Links), terminological services, master patient index and DVC[6] (Digital Vaccination Certificates). This phase also included generating the keys required for the Global Digital Health Certification Network (GDHCN) a trust framework built by the WHO, configuring and mapping the terminologies to be used and utilizing a wallet for VHL.

Finally, webinars were held on preparatory topics, such as the use of the testing platform and a detailed explanation of the evaluations that would be part of the connectathon.

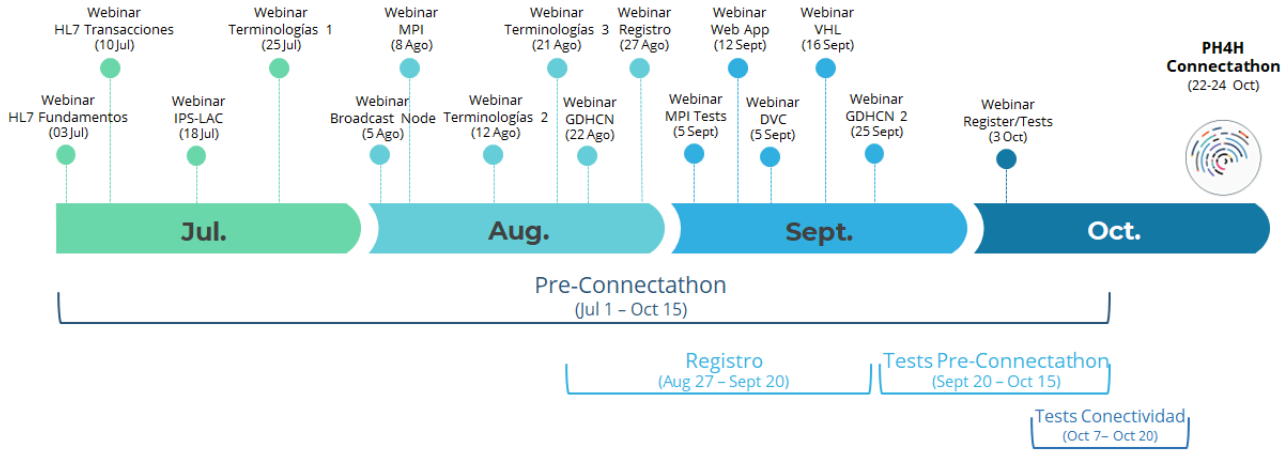


Fig. 3- 2024 roadmap

The image above provides an overview of all the webinars and training sessions that were conducted by the technical team in collaboration with WHO, CENS, Create SpA, ENTOMO, SNOMED International, and IHE Catalyst. All resources developed and used during the 2024 Connectathon are available here https://www.racsel.org/conectaton2024/.

[3] HL7 FHIR:https://www.hl7.org/fhir/.
[4] IPS: https://build.fhir.org/ig/HL7/fhir-ips/.
[5] MHD: https://build.fhir.org/ig/IHE/ITI.MHDS/branches/master/index.html.
[6] DVC: https://build.fhir.org/ig/WorldHealthOrganization/smart-icvp/StructureDefinition-DVC-ImmunizationUvIps.html

Connectathon Testing

The connnectathon lasted three days, in which the participants tested the tracks using Gazelle tools. Gazelle is a test platform aimed at testing the interoperability of eHealth information systems. It was developed by IHE-Europe with support from several other IHE member countries, including the USA, Japan, Korea, and Australia.

The test plans and testing tools were customized to the specific requirements of the deployment projects. Usually, the IHE Gazelle Testing Management Platform is used to give structure and order to perform the tasks and verify the testing, leading to project labeling. The lead organization for the project defines the test criteria for the project and publishes the results at the end of the connectathon. The platform is made available as a public good through RACSEL, allowing its use by the countries participating in the Connectathon.

Conducting tests on standards requires a controlled environment, making the use of specialized tools like Gazelle essential These tools, along with collaboration with third parties, ensure that tests are conducted accurately and effectively, maintaining a controlled environment that allows for reliable results. IHE, with years of experience in interoperability testing, has demonstrated the importance of having these resources and processes to ensure the success of system and standard evaluations.

Gazelle tools for PH4H Connectathon include:

- **Gazelle Test Management**: Manages the Connectathon process (test plan, reporting, test execution, etc.)
- **Gazelle Proxy**: Captures messages exchanged between systems and Countries for validation.
- **Gazelle EVS Client**: Validates request and response messages for various standards.
- **Gazelle MPI**: Simulates the Master Patient Index.

Fig. 4 and 5: Testing room 2024; Monitors on one of their daily meetings

Tracks and Milestones

For each of the 2024 Connectathon tracks, milestones were defined. These milestones determined the percentage of progress of the participating countries.

- Track 1 - The milestones defined for this track were: 1. To generate an IPS from EHR, 2. To generate VHL from IPS, 3. To search and retrieve IPS from other country nodes, 4. To read VHL and deploy it.

- Track 2 - The milestones defined for this track were: 1. Onboard to GDHCN, 2. Generate DVC, 3. Verify DVC of a third party country, 4. Validate the signature of a third-party country.

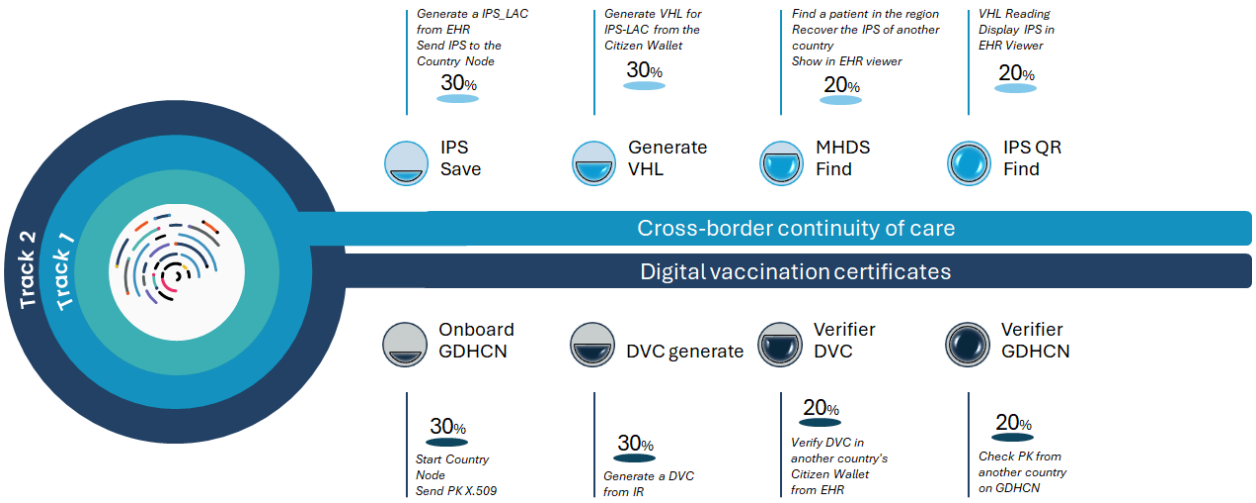


Fig. 6 - 2024 Milestones defined for each track

Connectathon 2024 Statistics per track

In total, 380 tests were executed, 345 were successfully verified, and 9 tests were partially verified.

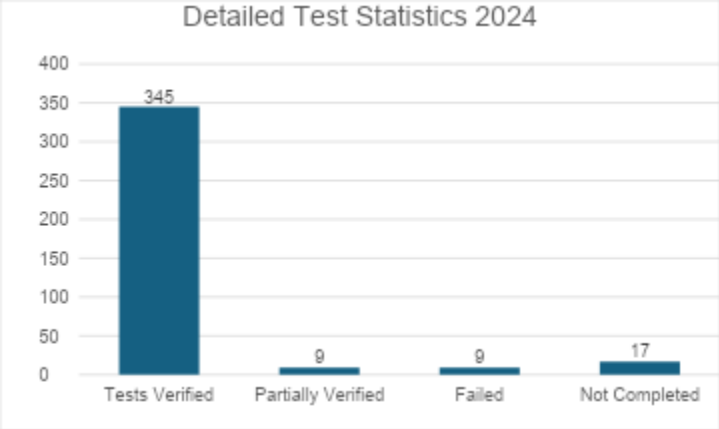


Fig.7: Tests results 2024

The connectathon aimed to test the knowledge and maturity in digital health of the region, fostering collaboration among countries. To date, three cross-border connectathons have been held within the LACPASS regional public goods: the first one took place in 2022 in Santiago, Chile; the second one in 2023 in São Paulo, Brazil; and the most recent one was held in 2024 in Bogotá, Colombia. The following table shows the testing Session 2024 comparing it with the two previous ones.

	2022 Connectathon (Santiago, Chile)	2023 Connectathon (São Paulo, Brazil)	2024 Connectathon (Bogota, Colombia)
Number of total tests executed	92	402	380
Number of tests verified	68	371	354

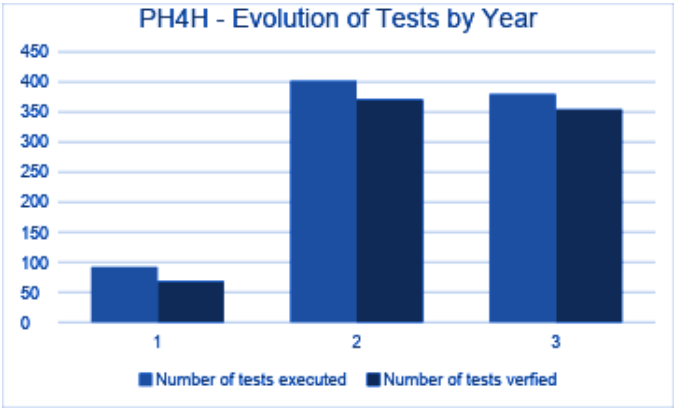


Table 1- Test Results in Comparison with the Two Previous Connectathon Events

This chart shows the evolution of the number of tests executed and verified during the connectathon events that took place in 2022, 2023, and 2024. It highlights the growth in testing activity, tracks, and participating countries over the years, with a trend toward stabilization after 2023.

Track 1: Continuity of Care - Statistics per sub-track

The goal of this track was for each participant to create its own IPS (International Patient Summary) based on the IPS-LAC profile and make it available through VHL (Verifiable Health Link), enabling user-mediated data exchange and mobile health document sharing.

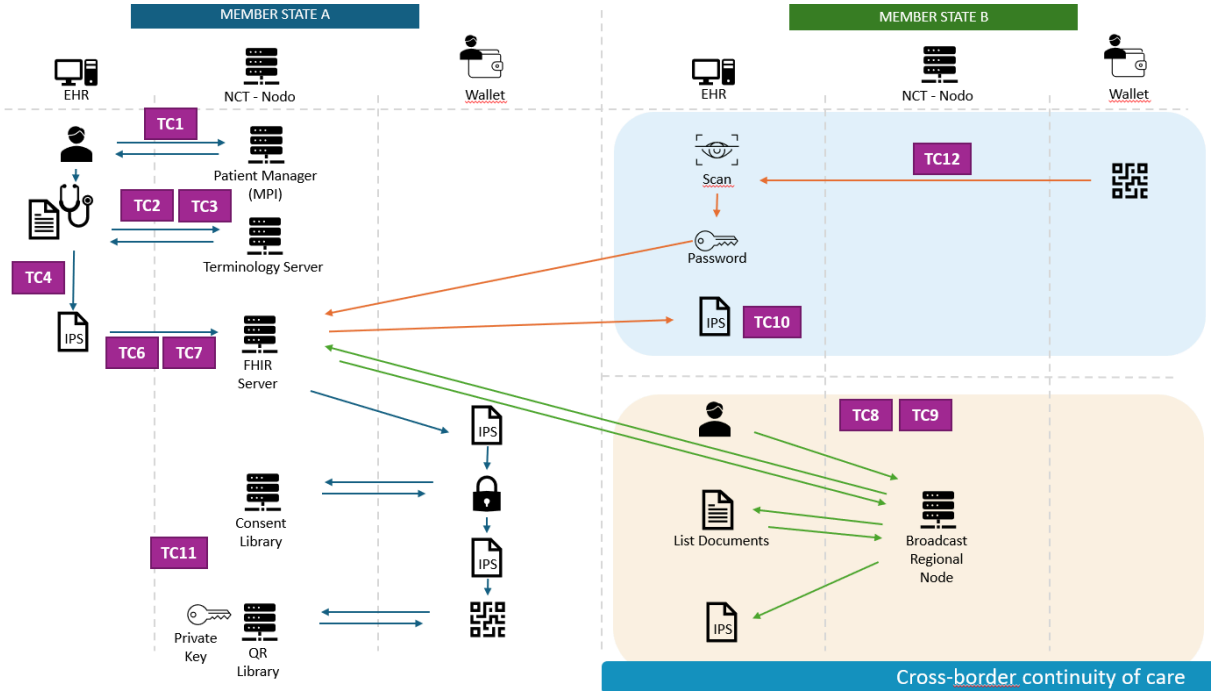


Fig 8: Track 1 Use-case description

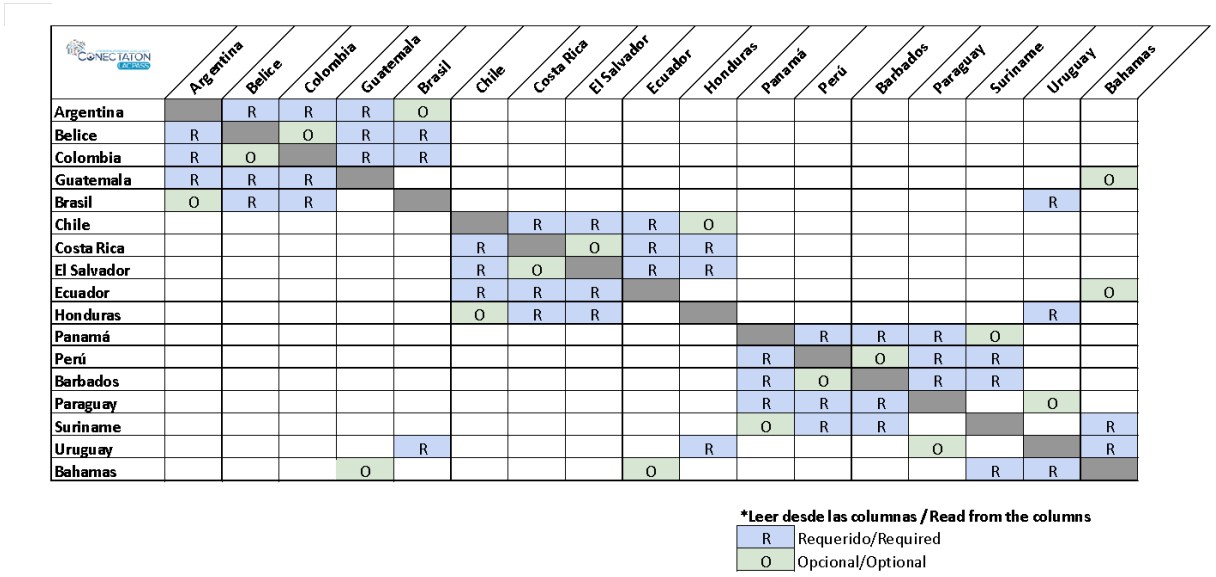
This diagram illustrates Track 1 through the interoperability between health information systems in two member states (A and B) to ensure cross-border continuity of care.

- **Member State A** includes systems like the EHR (Electronic Health Record) and Patient Manager (TC1-TC11) to test interoperability.

- **Member State B** has similar systems and engages with Member State A via test cases TC8, TC9, (MPI), Terminology Server, FHIR Server, etc. Each component has specific test cases TC10, and TC12, covering document listing, scanning, and password-protected access.

To organize the tests between member states, a partner was assigned to each country (Member State B). The peer-to-peer scenarios (TC8, TC9, TC10 and TC12) were executed three times with three different countries. It was also possible to execute the test a fourth time, but this was optional.

In the No Peer scenarios (tests without a partner, such as TC1 to TC5), Country A did not need a partner to execute the test. However, the test had to be run three times with three different sets of data (i.e., three different patients).



	Argentina	Belice	Colombia	Guatemala	Brasil	Chile	Costa Rica	El Salvador	Ecuador	Honduras	Panamá	Perú	Barbados	Paraguay	Suriname	Uruguay	Bahamas
Argentina		R	R	R	O												
Belice	R		O	R	R												
Colombia	R	O		R	R												
Guatemala	R	R	R														O
Brasil	O	R	R													R	
Chile							R	R	R	O							
Costa Rica						R		O	R	R							
El Salvador						R	O		R	R							
Ecuador						R	R	R									O
Honduras						O	R	R								R	
Panamá												R	R	R	O		
Perú											R		O	R	R		
Barbados											R	O		R	R		
Paraguay											R	R	R			O	
Suriname											O	R	R				R
Uruguay					R					R				O			R
Bahamas				O					O						R	R	

*Leer desde las columnas / Read from the columns

R Requerido/Required

O Opcional/Optional

Fig. 9: Partner Allocation for Each Country

Track 1 was focused on interoperability between health information systems in different member states, ensuring the continuity of care across borders. Participants tested systems like EHR or FHIR servers, executing peer-to-peer scenarios and no-peer scenarios to test interoperability.

Each participating country was required to bring 2, 3, 4, or more participants to execute the tests over the three days of the event.

Below is a summary of the test results for various sub-tracks of the Track 1

Sub-tracks	Gazelle Tests Cases	Tests in Gazelle in each sub-track	Total Successfully Verified in each sub-track	Number of LAC countries that succeeded in each sub-track
GDHCN Onboard	Covered in the TC11 and TC12	NA	NA	17
IPS LAC Preparation	TC1 TC2 TC3	73	68	15
IPS LAC Create and Save	TC4	39	26	14
MHDs Find	TC6 TC7 TC8 TC9	70	62	9
Consuming other country IPS	TC10	32	22	14
IPS VHL IPS Verify QR & Save	TC11 TC12	45	39	9

Table 2: Tests Results Track 1

Track 1: Continuity of Care - Results by Milestones

According to the milestones defined for the Continuity of Care track, the results achieved are measured based on the following indicators:

- 30%: Generate IPS from EHR.
- 30%: Generate VHL from IPS.
- 20%: Search and retrieve IPS from other country nodes.
- 20%: Read VHL and deploy it.

The completion level reached in the Continuity of Care track was **78%**considering the 17 countries that participated in the 2024 Connectathon (with formal testing on Gazelle), . This percentage reflects the overall progress of the countries across the various established milestones.

When we analyze the results by subregion, we observe the following percentage of completion:

- Central America: 86%
- Caribbean: 58%
- Andean Region: 77%
- Southern Cone: 92%

These data help identify areas for improvement and strengths in each region, which will be crucial for the development of the Pan American Highway for Digital Health (PH4H).

Fig. 10: Track 1 results by milestones, regional and sub-regional.

Track 2: Digital Vaccination Certificates - Statistics per sub-track

The objective of this track was to enable each participant to generate, interoperate, and validate an immunization certificate following the WHO Digital Vaccination Certificate (DVC) profile. This process required compliance with the FHIR standard, adherence to the WHO DVC guidelines, and the use of the LACPASS Docker platform.

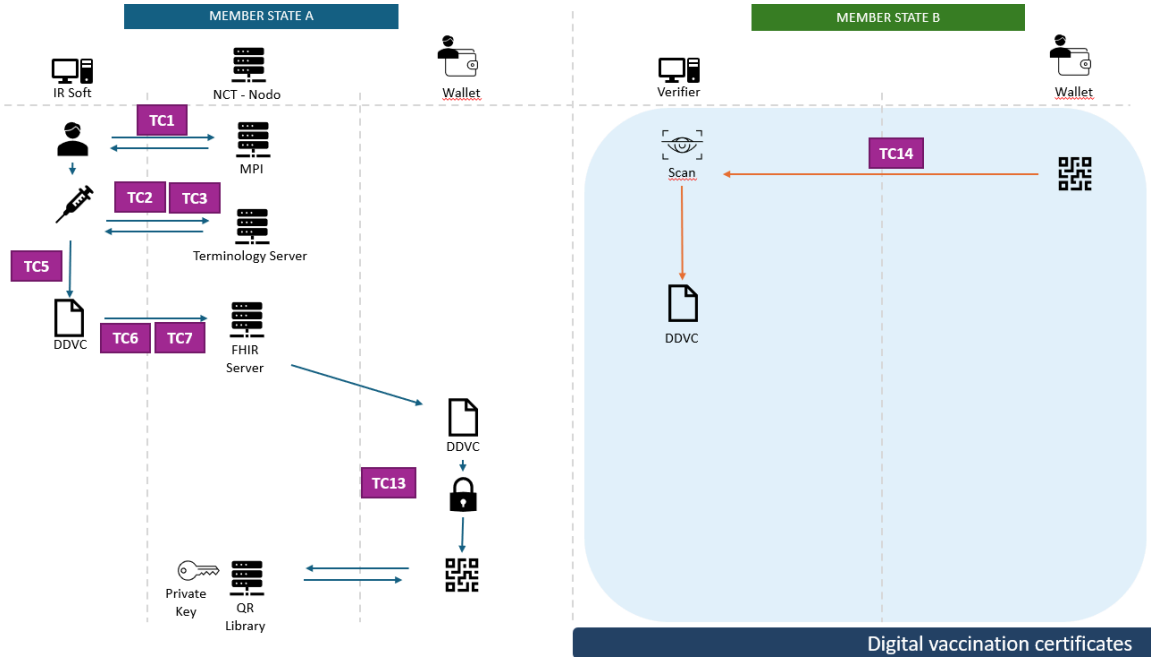


Fig. 11: Track 2 Use-case description

Track 2 involved testing the implementation of Digital Vaccination Certificates (DVC). A total of 121 tests were executed across 8 test cases.

Sub-tracks	Gazelle Tests Cases	Tests in Gazelle in each sub-track	Total Successfully Verified in each sub-track	Number of countries that succeeded in each sub-track
GDHCN Onboard	Covered in the TC13 and TC14	NA	NA	17
IPS VAC Preparation	TC1 TC2 TC3	30	30	15
IPS VAC Create and Save	TC5	29	29	14
MHDs Find	TC6 TC7	17	17	9
Transform QR DVC	TC13	17	14	9
Use/Valid QR IPS VAC	TC14	28	27	9

Table 3: Tests result Track 2

Track 2: Digital Vaccination Certificates - Results by Milestones

According to the milestones defined for the Digital Vaccination track, the results achieved are measured based on the following indicators:

- 30%: Onboarded to GDHCN.
- 30%: Generated DVC.
- 20%: Verified DVC of a third party country.
- 20%: Validated signature of a third party country.

In global terms, considering the 17 countries that participated in the 2024 Connectathon (with formal testing on Gazelle), the completion level reached in the vaccination certificate track was **81%.** This percentage reflects the overall progress of the countries across the various established milestones.

When we analyze the results by subregion, we observe the following percentage of completion:

- Central America: 78%
- Caribbean: 63%
- Andean Region: 100%
- Southern Cone: 88%

These data help identify areas for improvement and strengths in each region, which will be crucial for the development of the PH4H.

Fig. 12: Track 2 results by milestones, regional and sub-regional.

Conclusion

The PH4H Connectathon was an important milestone in advancing healthcare interoperability across Latin America and the Caribbean, with the goal of building a connected digital health infrastructure that ensures continuity of care throughout the region. The participation of 18 countries and collaboration with key stakeholders, such as governments, telecommunications experts, and international organizations like PAHO and WHO, underscores the importance of these efforts to strengthen digital health systems.

Results achieved in the two main tracks —Cross-border Continuity of Care and Digital Vaccination Certificates— reflect significant progress, with 81% completion in the continuity of care track and 78% in the vaccination track. The regional average completion rate per milestone is **79.4%**, highlighting both areas of opportunity and strengths across different sub-regions. This data will be essential for guiding the future development of the PH4H, identifying challenges, and promoting regional cooperation in the implementation of international digital health standards.

This year's connectathon resulted in the implementation of key outcomes for the region. Seventeen FHIR nodes were tested and delivered to the participating countries, along with a terminology server configured for subsets tailored to local terminologies. Additionally, personnel were trained on key standards and tools, enhancing technical skills. As a result, 17 countries were onboarded to the GDHCN development environment, marking a significant advancement in regional interoperability.

Despite some challenges faced by a few countries in executing the tests, the event was successful, with 380 tests conducted and 50% of participating countries successfully completing each milestone for both tracks. These achievements mark a decisive step toward the goal of ensuring an interoperable and accessible digital health system for all in the region. The next event, scheduled for September 2025 in El Salvador, will provide a new opportunity to continue advancing the development of a connected and efficient health infrastructure in Latin America and the Caribbean.

Fig. 13: San Salvador, host city of the 2025 PH4H Connectathon

Annex

Testing event 2024

The event was organized into two main phases : pre-Connectathon & Connectathon testing

Pre-Connectathon

For each of the technical teams from the participating countries, the main requirement to properly participate in the Connectathon was to set up a public server to deploy the tools implemented in the regional public good. These tools were packaged in a docker compose containing all services required for the implementation of IPS (International Patient Summary) and Digital Vaccination Certificate (DVC).

The services created by the compose are:

Service	Detail
• Hapi FHIR	Spring implementation of FHIR
• Hapi FHIR Database	Psql database for the FHIR server
• Snowstorm	SNOMED CT Terminology server
• Elastic Search	Used by Snowstorm terminological services
• Snowstorm Browser	Web UI for Snowstorm
• LACPass IPS Viewer	Web based example front end for IPS visualization
• DVC Mediator IPS and service	Mediator services for IPS Immunization and DVC
• Bundle signer service	PKI Signer service
• IPS Mediator for MHD Transactions	Mediator services for IPS-LAC/MHD transactions
• IPS to DVC transformation operation	IPS to DVC transformation services

• Verifiable Health Links (VHL) service	VHL Generator service

Table: Services available in Docker Compose

Event Evolution in Figures

The test sessions were managed using Gazelle, a platform that ensures participants' systems align with the PH4H project tracks. Over time, the event has grown significantly regarding participant countries, systems, and tests conducted.

	2022 Connectathon (Santiago, Chile)	2023 Connectathon (São Paulo, Brasil)	2022 Connectathon (Bogotá, Colombia)
Participating countries	8	16	17
Number of monitors	5	11	12
Profiles Tested	1	4	5
Tests executed across tracks	83	403	380

Table: Comparison of Connectathons (2022-2024)

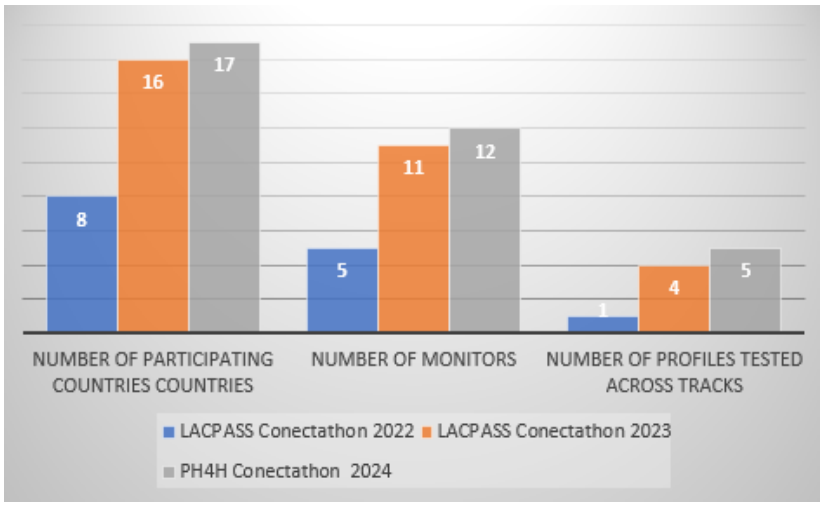


Fig. : Comparison of Connectathons (2022-2024)

The number of profiles tested has increased significantly over the years, demonstrating the event's expansion. Although the number of tests executed slightly decreased in 2024, the results remain significant, indicating continued growth and relevance of the event.

Condition for Success in Track 1 and Track 2

The condition for success in Track 1 was to successfully execute all the test cases (TC1 to TC14) listed in the second column of the tab results. Each of these test cases should have been executed at least three times with three different partners for tests that require a partner (peer-to-peer tests). For tests that do not require a partner, they should have been executed at least three times to involve three different patients.

Due to a time issue, this number was reduced to 1 test to be executed instead of 3.

Metric	Track 1	Track 2
Number of Countries with Success	9	11
Success Rate by Country	50%	61%
Total Tests Executed	259	121
Tests Successfully Verified	217	117

- **Track 1**: 50% of the 18 participating countries validated Track 1 with a functional system, while 9 countries failed or did not complete the tests.
- **Track 2**: 61% of the 18 participating countries validated Track 2 with a functional system, while 7 countries failed or did not complete the tests.