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LUCAS CARMONA & DANIEL PARAMO

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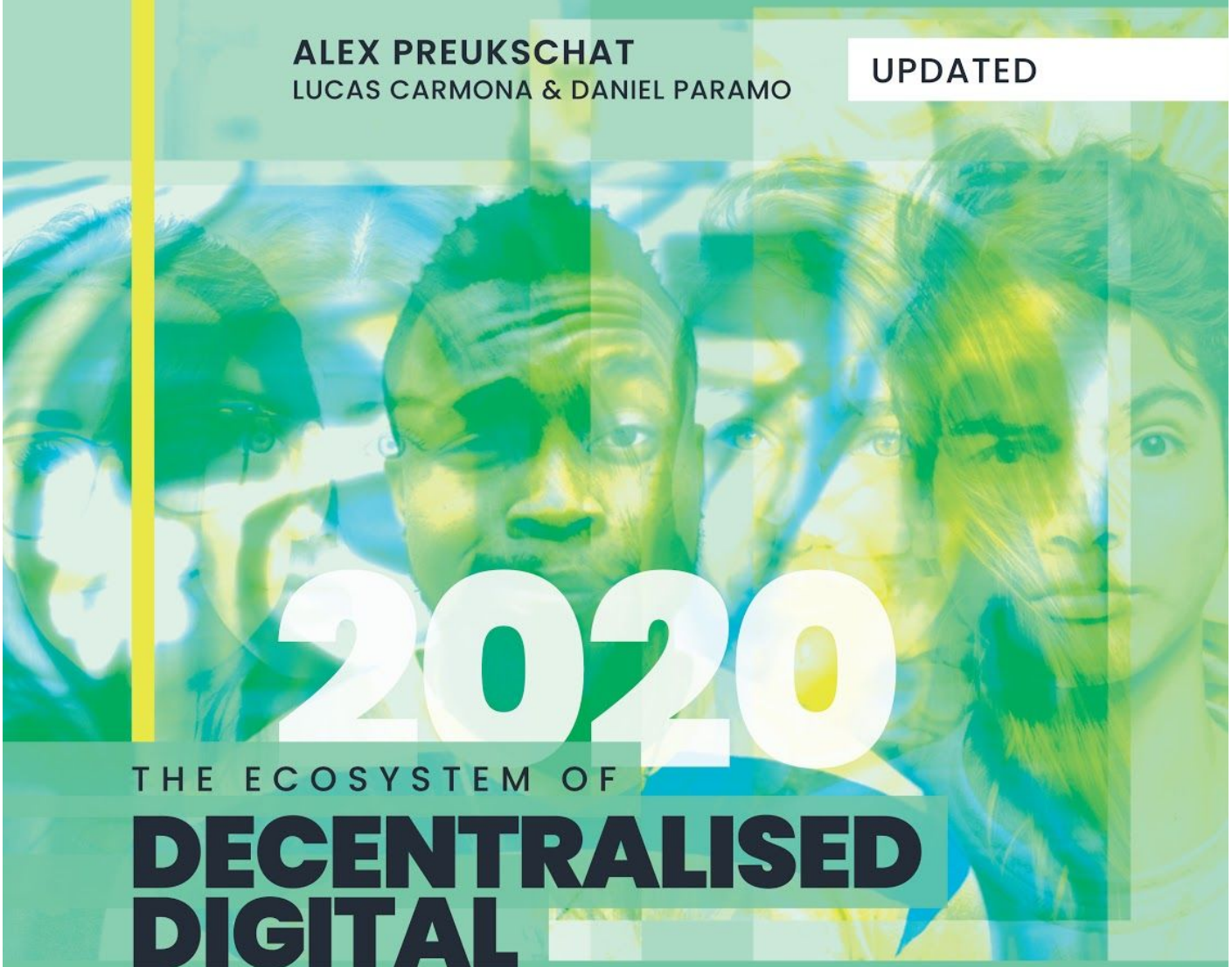

# 2020

THE ECOSYSTEM OF

# DECENTRALISED DIGITAL IDENTITY

IN THE SPANISH AND PORTUGUESE SPEAKING WORLD

HOW **SELF-SOVEREIGN IDENTITY** — SSI, IS SHAPING UP IN THE IBEROAMERICAN WORLD

ENGLISH EDITING BY PHILIP SHELDRAKE AND ALEX ANDRADE-WALZ

IMEETUP SELF-SOVEREIGN IDENTITY
ALIANZA BLOCKCHAIN IBEROAMÉRICA
BLOCKCHAIN ESPAÑA

# THE DECENTRALIZED DIGITAL IDENTITY ECOSYSTEM IN THE IBERO-AMERICAN WORLD

2020

*How the concept of "Self-Sovereign Identity" (SSI) takes shape and acquires meaning in the Spanish and Portuguese-speaking world*


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# SSI in Ibero-America

Self-Sovereign Identity (SSI) is booming, and we expect it to be one of the main unifying technologies of the blockchain and decentralized world. Unlike our first report, we have chosen, for this edition, to prepare a shorter executive document that reflects the main trends in the region. In this study, we will focus on Ibero-American initiatives that are either done in the name of SSI or have elements strongly resembling SSI, rather than simple authentication experiments that are further away from the principles of SSI.

The SSI movement is very young, although the concept has been incubating for more than two decades. We have the biannual events of the "Internet Identity Workshop" (IIW), led by Phil Windley, Doc Searls, and Kaliya Young in San Francisco, as well as the more recent "Rebooting the Web of Trust" (RWOT), led by Christopher Allen, who celebrated his eighth edition in **March 2019 in Barcelona, Spain** and the upcoming tenth edition in **March 2020 in Buenos Aires, Argentina**.

The thought leadership and SSI technology have emerged mainly in these two forums (IIW and RWOT), attracting talent and entrepreneurs around the world and growing the ecosystem. Most of the Ibero-American initiatives, if not all, have been significantly inspired by or work with one of the leading architectures incubated in these two forums.

In recent years, the traditional blockchain players (Bitcoin, Ethereum, and their other variants) and the actors of the DLT world (Distributed Ledger Technology - Hyperledger Indy and its variants), have been active catalysts of the SSI world.

However, SSI is not a technology; it is a philosophy of principles that makes use of blockchain, DLT, or other decentralized technologies. Christopher Allen[1] lists the 10 principles of SSI in his detailed article "The Path to Self-Sovereign Identity". These ten principles are summarized in three categories: security, control, and portability.

A primary goal of SSI is to ensure that identity is **secure**, that people **control** who can read and access their information, and that people can use the information about their identity in any context without being tied to a provider through **portability**.

| | | |
|---|---|---|
| **Security** | Protection | Identity is more important than the network |
| | Persistence | The identity must be persistent as long as the person wants to keep it |

[1] http://www.lifewithalacrity.com/2016/04/the-path-to-self-soverereign-identity.html

| | | |
|---|---|---|
| | Minimization | The disclosure of information should be restricted to the minimum necessary |
| **Controllability** | Existence | People exist independently of their digital "self" that is only part of their identity |
| | Control | People control the visibility and privacy of their identity |
| | Consent | People must consent to the use of their identity and accept credentials to be valid |
| **Portability** | Interoperability | The identity of people must be interoperable and not live in a silo |
| | Transparency | Systems and algorithms for the management, maintenance and updating of identity must be free and open independent of any architecture |
| | Access | People must have access to all information about their identity |
| | Portability | The identity of people must be portable between different systems |

The capital, talent, and entrepreneurship of the world in the field of decentralized digital identity is concentrated in North America, Europe, and in primitive nuclei that have emerged in South Korea, Australia, and New Zealand. We differentiate between SSI and decentralized digital identity because it is possible to be decentralized without being self-sovereign. That is, not all of the initiatives that are called SSI really aspire to satisfy the ten principles proposed by Christopher Allen, which form the philosophical and ideological basis of the SSI community. In the Ibero-American world, we have a similar situation in that there are initiatives called SSI, although they are far from complying with all the aforementioned principles.

Similar reasons are found around the world from initiatives that differ from the principles, but with local nuances in the Ibero-American world.

As we will see below, the challenges are of a different nature. The first and the second are global and the last two are specific to the Ibero-American world,

compared to the countries that have most resources to bet on exponential technologies.

These challenges are:

1. The disconnection of the blockchain world from the SSI world
2. The rigid view of the status quo
3. Technological innovation as marketing
4. The lack of a support network to finance entrepreneurship in the SSI world

**1. The disconnection of the blockchain ecosystem from the SSI world**

On an ideological level, the blockchain world is the closest in adherence to the SSI principles. Nevertheless, the blockchain world (Bitcoin, Ethereum, etc.) has shown limited interest in understanding all the advances that the SSI community has made in the last fifteen years. There are hardly any communication bridges between the blockchain and SSI communities, and we hope that these will increase. The most active global project in the blockchain world is uPort part of the ConsenSys group, which builds on the Ethereum blockchain and has been led in recent years by two Iberoamerican residents (Andrés Junge and Pelle Braendgaard, who left uPort at the end of 2019).

The local reference in the blockchain world is the “Bitcoin Argentina NGO” DIDI initiative in Argentina, an initiative in collaboration with the Inter-American Development Bank (IDB), that operates in Barrio Múgica, Buenos Aires, as an instrument of financial inclusion. DIDI’s CTO joined the RSK team in 2020 to lead the identity initiative.

We also hope that RWOT’s tenth edition conference in Buenos Aires can create more bridges between the blockchain community and SSI. The level of resources required by an SSI initiative with potential is substantially higher than the resources we have seen deployed to date. Active participation in the main SSI forums is also needed, as in the W3C Decentralized Identifier (DID) working group, the Decentralized Identity Foundation (DIF) community (whose most active members are Microsoft and ConsenSys), in the different working groups of Hyperledger Indy, in the MyData community, and many other initiatives that are underway, to foster interoperability that has not yet been made public or realised.

As in the rest of the world, in the Ibero-American blockchain world, in general terms, many of these developments have become stuck in an architectural vision that tries to apply blockchain to too many concepts, without understanding the complexity and wealth existing in the SSI world.

Unlike the SSI world, where economic resources are guided by the traditional limitations of venture capital in many cases, in the blockchain world there are substantially more economic resources to develop SSI, but the bridges between the two communities have not yet been created with the important exception of uPort.

The article by Kristen Stone, who worked for five years at Coinbase, gives a realistic vision from our perspective, of the challenges facing the world of blockchain protocols globally: "The Bear Market Blues: a broad look at challenges inside crypto companies from late 2019 into 2020".

**2. The rigid view of the status quo**

The challenge of the Blockchain world is that it tends to look at everything through the Blockchain prism, often ignoring the intrinsic complexity of identity. The challenge of the agents of the status quo, that is, governments and large corporations, is that they tend to look at the problems through the centralization prism that can often be too rigid for a transformative technology.

Exponential technologies such as SSI are disruptive by their very nature and governments and corporations try to incorporate these technologies, but in many cases with a limited view of the proposals contained in the ten SSI principles. This vision restricts the natural benefits that are proposed, leaving these initiatives conceptually weak.

The most active agents in Ibero-America are the Alastria consortium in Spain and the Inter-American Development Bank (IDB) throughout the Latin American continent. These two organizations, which also maintain important links between them, are the best funded of all Latin American initiatives. In the case of Alastria, due to the access that Spanish companies have to the European Union SSI projects. In IDB's case because of its privileged position of access in the region and its financial resources as an international organization.

One of the most striking limitations for both organizations is that they hardly participate in the main SSI forums worldwide, a circumstance that leads to a deficit of specialized talent and loss of opportunity to generate mutual synergies. In this sense, we would also like to see a much more active participation of these ecosystems in the SSI community. Our article "A Simple Guide to Understanding the Difference Between Blockchain and Distributed Ledger Believers" can serve as an orientation of the origin of this prism and the effect it has for both communities.

**3. Technological innovation as marketing**

In the Ibero-American world, more than in the most advanced technological countries, attempts are being made to create, in many cases, the illusion of innovation as a marketing instrument. Innovation in this context becomes a way to create an image of avant-garde, modernity and progress, but without intentionally innovating in a real way. This phenomenon obviously also exists in the most advanced countries, but in the Ibero-American world it is more marked. If we want initiatives to emerge that have the potential to be part of exponential technologies such as SSI, we must have solid, constant and permanent funding and support environments over the long run.

**4. The lack of a support network to finance entrepreneurship in the SSI world**

The key, not only for the Ibero-American SSI world, but also for the world of technological innovation in general, is that we need financing networks to make entrepreneurship stronger. The natural way for this to happen is for other

successful entrepreneurs to invest in the next generation. Nevertheless, the Ibero-American countries have the opportunity to create a favorable environment to attract talent and capital. If they fail, talent and capital will continue to seek opportunities in the most favorable environments.

**SSI: next steps**

The SSI ecosystem is still immature globally and we have many years of work ahead, but an infinite number of future opportunities at the same time. That is why we present this study for the year 2020, to put the focus on one of the global technological opportunities and thus try to position our countries as part of the countries at the forefront, to hopefully, become a dynamic sector in which Ibero-American countries collaborate intensely.

We have toured the Ibero-American region in preparation for this study but there are projects in the region we have not been able to include for reasons of confidentiality. Once they are made public, we will include them in the 2021 edition.

In our book "Self-Sovereign Identity" to be published in the United States by Manning (IdentityBook.info) we explain and explore in detail the future of this technology. The first chapters from some of the global leaders of the SSI ecosystem are already available online and are scheduled for publication in late 2020. With this report, we seek to illuminate the current Ibero-American initiatives with detailed information, while also hoping for more support and collaboration from governments, regulators, companies and entrepreneurs.

For those who want to deepen their knowledge of the SSI world, we recommend consulting SSIMeetup.org. The resource offers PowerPoint presentations and webinar recordings.

We hope you enjoy reading and have the commitment that we will continue to expand the report annually to include news and incorporate corrections and appropriate modifications.

Thank you,

Alex Preukschat

SSIMeetup.org

Blockchain España

Alianza Blockchain Iberoamérica

# Country Study

Countries sorted by population

# *Countries with Projects*

## Brazil

Public administrations are proactively encouraging experimentation with proof of concepts for DLT technologies in Brazil. Although they are not SSI technologies, we have compiled them to give an idea of current activity.

**Identity Tech**, in collaboration with Microsoft, built on uPort/ConsenSys, is a project in which decentralized digital identity serves as a gateway to services offered by public administrations with DLTs.

**BlockIoT**, built on Hyperledger Indy, is a project that also has institutional support and aims to offer solutions for the IoT (Internet of Things) field of CPQD (Centro de Pesquisa e Desenvolvimento em Telecomunicações).

The **Central Bank of Brazil also in collaboration with CPQD** has developed a proof of concept building on the Corda R3 platform to experiment with a "decentralized digital identity" system that facilitates the identification of users with their banks.

The **commercial banks in Brazil and the Central Bank of Brazil** announced in 2019 a collaboration with IBM, building on Hyperledger Fabric to create a DLT based identity system supported by the Brazilian Payment System (SPB) to facilitate the identification of bank users using the information on mobile phones and their SIM cards.

**bCPF (Blockchain do Cadastro de Pessoas Fisicas):** a G2G (Government to Government) pilot project that aims to simplify the processes of access to government services using DLT technology.

The development company **Dooim** developed a digital signature system in Ethereum Ropsten with an EIP 1078 identifier for Certisign, the largest certifying authority in Brazil.

Finally, **eID+** represents another project, in this case from the private sector, in which a Swiss company chose Brazil as the headquarters for the deployment of projects for the Ibero-American area.

# Mexico

Mexico is one of the most important countries in Latin America, but there is a very limited SSI community compared to other Ibero-American countries. It is worth mentioning the initiative of Tecnológico de Monterrey, a private university that has a strategic alliance with MIT, that has developed a use case of decentralized digital identities for education.

Internet of People (IOP) is a Mexican project betting on decentralized digital identity and is in the process of developing a decentralized identifier proof of concept in 2020 with Universidad de Nayarit.

These initiatives related to identity took place in Mexico in recent years:

- IDMX - Mexico Digital Identity Seminar - 1st Edition 2018
- IDB - The Ibero-American Development Bank supporting Digital Identity
- INE - National Electoral Institute

# Spain

In Spain, three relevant initiatives explore the SSI world from different perspectives:

**ValidatedId**, a company based in Barcelona as a provider of digital signatures, has created an SSI unit to experiment with different platforms and proposals, looking for what could be a future disruption of its traditional business model.

**Iden3** also based in Barcelona and also present in Zug (Switzerland), arises from the work of Jordi Baylina to create an SSI system within the Ethereum ecosystem with a strong privacy component based on Zero Knowledge Proofs (ZKP) cryptography.

Finally, major Spanish corporations created the **Alastria** consortium in 2017 that has pivoted in different directions since launch. With 500 partners, it's main focus in 2019 and 2020 is decentralized identity. The work of Alastria has crossed paths with initiatives like Digitalis, and it actively participates in the SSI project of the European Union (ESSIF).

It should be noted that a Spaniard, Óscar Burgos, is the leader of the ESSIF initiative of the European Commission.

Blockchers, a grant-supported initiative of the European Union (EU), financed a Spanish SSI project in the education world, involving Factory Matters[2] and ValidatedId. ValidatedId and everis (a consulting firm) are also part of the development team of the European Blockchain Services Infrastructure (EBSI) identity wallet. Everis is also an active participant in the Alastria consortium and the IDB's LaCChain network.

The Spanish Savings Banks, led by CECABANK, have also created a pilot test called Niuron to experiment with digital identity. Along the same lines as with Grant Thornton's Savings Banks project, Repsol and Ferrovial, with the collaboration of other large companies such as Banco Sabadell, Cepsa, Grupo Red Eléctrica and Mapfre, launched Digitalis to verify the documentation of suppliers to simplify the certification and validation processes.

Other initiatives in the Spanish arena are Caelum Labs from Barcelona, close to the Ethereum environment with the ERC 725 standard, supported the organization of the Rebooting Web of Trust conference in February 2019.

Gataca is another Spanish startup incubated at MIT with an operational base in Spain that aims to provide a comprehensive decentralized digital identity solution with a focus on compliance with KYC and GDPR regulations.

In the academic world, ESADE Business & Law School and Lydian Ventures have experimented to create digital academic records based on Ethereum ERC 725/735. As in other Ibero-American countries, Blockcerts has been used as proof of concept at Carlos III Madrid University for the issuance of educational credentials to students.

[2] A company by the co-author of this report Lucas Carmona

CertIDchain is another project for educational institutions by Emergya and Tecnalia to be piloted in the second half of 2020 at: Universidad de Mondragón and ESIC Business & Marketing School.

**Spain in the European Union initiatives for SSI**

As on so many other levels, Spain benefits greatly from being one of the most important countries of the European Union (EU) in terms of population and geopolitics, and has access to all kinds of initiatives that encourage innovation.

In the case of SSI, the EU launched the European Self-Sovereign Identity Framework (ESSIF) in 2019 as part of the European Blockchain Services Infrastructure (EBSI) in which the Spanish Public Administration and Alastria actively participate. ESSIF will develop other use cases such as academic credentials, which will allow for verification in any EU member country. In addition, the eSSIF-Lab, an initiative endowed with € 5.6 million euros, launched in December 2019 to finance up to 62 European SSI projects.

**Spanish SSI Policy**

Although the central government of Spain has traditionally supported digital identity technology, as with the DNIe (Documento Nacional de Identidad electrónico) - the national electronic ID, there is less activity by the Spanish Public Administrations in the experimentation and prototyping of decentralized digital identity solutions.

This trend has been reinforced with a Royal Decree-Law 14/2019, which has imposed a moratorium on the administration of decentralized identity solutions based on DLTs, such as SSI. The suspicion of many has been that this Royal Decree was a political measure to curb the ambitions of the Catalan government to create a decentralized digital identity system called IdentiCAT.

# Argentina

The Argentine Republic has a consolidated community and companies with deep technological knowledge in Blockchain, some of which are global leaders. To cite two examples, we find top-level developers in projects such as RSK, the “sidechain” on the Bitcoin network, and Zeppelin, specialized in defining standards for the development of smart contracts and for performing security audits.

Argentina stands out for its social focus, breadth of vision and ambition of objectives, as well as institutional and financial support. In this regard, the support of the IDB (Inter-American Development Bank) for the DIDI project, which aims to scale the benefits of its proposal far beyond its original scope of action, building on uPort/ConsenSys and RSK. DIDI´s CTO has joined the RSK team in early 2020 to lead its SSI practice. DIDI is a project led by DECODES, the NGO Bitcoin Argentina, an entity part of the Alianza Blockchain Iberoamérica.

The Argentine Federal Blockchain (BFA), an initiative similar to Alastria in philosophy, has slowed down with the change of government. BFA had, in principle, the support of 200 companies but had not yet defined a clear plan for decentralized digital identity.

Other initiatives from previous years include the pilot conducted by the Universidad Provincial del Sudoeste in the educational sector for the issuance of their degrees with Blockcerts, which are anchored to a public Blockchain, and initiatives by companies such as Red Link and Signatura.

# Colombia

The city of Bogotá hosted the LaBitConf conference in 2017 and the Blockchain Summit Latam in 2018. In May 2018, the Blockchain Colombia Foundation, an entity belonging to the Alianza Blockchain Iberoamérica, was established. There have also been specific meetings on the subject and by community members as Mauricio Tovar and Ángel Mesías who have been working on the subject at the Universidad Nacional de Colombia.

The activity in the SSI space in Colombia is limited, but some startups are experimenting with identity as Lynk Digital. The Universidad del Rosario has implemented a prototype for educational credentials with Blockcerts and Hyperledger Indy. The Colombian company Xertify, was accepted at the end of 2019 in the first SSI incubator in the world called SSI Incubator in San Francisco, also it promotes digital credentials in Ibero-America using Blockcerts and Verifiable Credentials. They collaborate with the government of the state of Querétaro in Mexico, La Universidad Javeriana, American School Way and the Red Cross in Colombia.

# Transnational projects

## *LACChain ID*

LACChain is a Global Alliance for the development of the blockchain ecosystem in Latin America and the Caribbean led by the Innovation Laboratory of the Inter-American Development Bank (IDB Lab) . The program, launched in 2018, was approved by the IDB donor committee on March 20, 2019. Last year LaCChain proposed a three-layer architecture design.

The **first layer, LACChain DLT**, is a public-permissioned network conforming to regulation, with an on-chain governance model and zero transactional cost. This layer enables the tokenization of any real asset, thus allowing the deployment of any type of blockchain application.

The **second layer, LACChain ID**, seeks to offer identification and authentication at all levels following international standards of sovereign digital identity (SSI), such as DIDs (Decentralized Identifiers) and VCs (Verifiable Credentials).

The **third layer, LACChain TFM**, seeks to establish the necessary protocols and attract financial entities authorized to issue electronic money, to provide a digital currency in the network backed by fiat money. This infrastructure model, presented in 2019, has been recognized by the committee of the United Nations telecommunications (ITU) as one of the 14 global blockchain reference architectures (ITU-T FG DLT D3.1).

The purpose of the identity layer, LACChain ID, is not to develop its own solution for LACChain, but to establish common basic standards and protocols, aligned with international standards and practices. Once this base has been defined, it will seek to attract and promote identity solutions that comply with the proposed practices, incorporating them into the LACChain ID Marketplace.

With the above purpose, LACChain launched the identity working group at the end of 2019. The first draft of the standards and protocols, entitled “LACChain ID Techno-Legal Framework”, was presented in December and discussed in the working group. In this document, the following categories are considered as basic pillars necessary for any identity solution:

**Technological components**
Decentralized identifiers (DIDs)
-Verifiable credentials (VCs)
-Verifiable presentations (VPs)
-Authentication
-Sign on

-Key storage and recovery
-Credential storage and retrieval
-Traceability and monitoring
-Zero knowledge tests (ZKP)
-Trust frameworks
-Regulatory policies
-Privacy
-Regulatory policies
-Identity providers (IPs) and certifying authorities (CAs)
-Trusted lists (TLs)
-Trust levels (LOAs)

A working group with collaborating entities such as everis, which provides its trust platform KayTrust, has developed these standards and protocols since inception. With its uPort product, ConsenSys' collaboration with IDB has been essential.

Additionally, LACChain will carry out a proof of concept in the first half of 2020 of post-quantum cryptography to add an additional layer of security in the authentication of the nodes over the network, which will allow it to test its resistance to quantum computing.

# *Countries with Communities*

## Peru

Peruvian public institutions have a system for Electronic National Identity Cards (DNIe) promoted since 2013 by the Registry of Identification and National Civil State (Reniec). The Peruvian DNIe has been considered the best identity document in Latin America in 2015. Thanks to this project, Peru is part of the ID4D South-South Exchange Program developed by the World Bank, which encourages the exchange of experiences, technologies and knowledge in areas such as digital identification.

In addition, Peru participates in the CADENA pilot project seeking mutual recognition of customs programs with Blockchain technology, along with Costa Rica and Mexico. This project is supported by the IDB (Inter-American Development Bank) in addition to the title and land registration project financed by the bank.

At the time of writing this report, no projects with decentralized Digital Identity on Blockchain have been found.

## Chile

Andrés Junge, one of the initiators and architect of the uPort / ConsenSys project, is Chilean and an active member in the Bitcoin and Blockchain community since 2010. However, Junge left uPort in early 2020.

In 2018, the Government of Chile initiated a roundtable discussion about Blockchain in which decentralized digital identity was one of the subjects.

There is great interest in digital identity, but no decentralized digital identity project with Blockchain technology has been found at the date of writing this report.

In addition, Chile has a single code Digital Identity system to access government services. This could be an interesting baseline for future developments that use blockchain technology.

## Portugal

Portugal has a solid National Digital Identity system with its ID card, started in 2007 and implemented for 100% of the population since 2014.

As a sign of the willingness of the entities of the country to promote the adoption of decentralized digital identity, we highlight the challenge proposed by the Municipal Mobility and Parking Company of Lisbon, establishing the requirement to include the main features of SSI such as Decentralized Identifiers (DIDs) and Verifiable Credentials (VCs).

# Uruguay

The most active community in Uruguay is Crypto Bay Montevideo, a member of the Alianza Blockchain Iberoamérica. There have been important blockchain events such as the BlockchainSummit.UY in its second year in 2019. Labitconf held the main Blockchain conference in Latin America in Uruguay at the end of 2019.

The Agency for Electronic Government and Information and Knowledge Society of Uruguay (AGESIC) was created in 2007, and has a consolidated national identity system that is also experimenting with Hyperledger Indy technology in collaboration with the academic world.

# Costa Rica

The Central American country has a Blockchain ecosystem in which the Blockchain Association Costa Rica stands out as an official and organized representation of the movement and that supports specific communities, such as Blockchain CR, Bitcoin Community, and EOS Costa Rica. The TICO Blockchain Conference took place in February 2019.

There are initiatives to use digital identity in conjunction with RACSA (Radiográfica Costarricense, the information technology company of Costa Rica), the TSE (Electoral Supreme Court), the Ministry of Finance with SICOP (Integrated System of Public Procurement) and EDUS (Costa Rican Social Security Fund) for a digital medical record. Private development companies such as EOS Costa Rica are exporting blockchain-based software and working with local entities to define use cases.

Here we also find the IDB, via LACChain, in talks with the local community to create a regional decentralized digital identity solution.

# *Countries not included in this edition*

We want to refer in this section to Ibero-American countries that have not been included in the report. Their absence is because we have not detected projects or activity of SSI projects in the research for this edition of this report.

Decentralized Digital Identity is a growth area linked to Blockchain technology. Upcoming revisions of the report will reflect the technological evolution and adoption in the ecosystem.

# Understanding the SSI world

SSI can increase efficiency for companies in getting the identity assurances that they need. It can prevent the massive data breaches that have become weekly headline news, and it can also allow people to decide how their data is shared and monetized — earning them more of its real value.

People will be able to get all of these benefits without having to rely on third party "identity providers" such as Google and Facebook to store and share their personal data. Instead, individuals will be able to have all their digital identity data at their fingertips, ready to share easily and selectively exactly how they wish.

To understand how this works, let's explore the meaning of identity, something surprisingly difficult to pin down, and examine some of the applications that Self-Sovereign Identity will enable to see the impact that this upcoming change will have on all our lives.

### *What is identity?*

Identity is something difficult to agree on. Before the industrial revolution, identity was defined by family and the clan. Identity in the industrial society, as we know it today, is often related to "bureautic identity", which is defined by our Passport or any other Government issued identity document. The next evolutionary step for identity could be defined by our social graph, as described by David Birch in his book "Identity is the new money". It takes us back to the concept of identity of the

pre-industrial era, but in a digital context. Our social graph is a representation of our true human relationships and not by social networks like Facebook.

From a functional point of view, identity can be the sum of attributes associated to a person (age, height, birth date, biometrics, etc), attributes accumulated over time (medical information, preferences, communication metadata, etc) and designated attributes (telephone number, email, Passport numbers, etc), but we can go beyond people and also talk about legal identities, identities of devices or assets which are often linked to human identity.

### *Types of digital identity models and Self-Sovereign Identity*

In general, there are two approaches to managing digital identity. The centralized model and the decentralized model. Self-Sovereign Identity is a spin-off from the decentralized model and thus creates a third approach.

The centralized models can be divided into two. The Scandinavian and The Continental Identity models. In the Scandinavian model private companies (financial and telecom firms) provide a centralized digital identity service to interact with the government (TUPAS in Finland or BankID in Sweden etc). In the Continental model, Governments provide digital identity services to companies allowing interaction with their citizens. All these centralized models are described in an excellent World Economic Forum report published in August 2016 that can be downloaded for free.

Self-Sovereign Identity takes on different approach to the centralized model, its focus is not “who we are?”, but “what can I do?” as described brilliantly in the reference document by Christopher Allen about Self-Sovereign Identity and the “Ten Principles of Self-Sovereign Identity”.

If we want to access a building or an event we often have to show our ID card. Does it really make sense for us to be obliged to show sensitive private information, such as our full name, address and more, if the only thing required is whether we are authorized to enter by age or any other condition? The proposal from Self-Sovereign Identity is that a simple question needs to get a simple confirmation or answer without having to reveal more about ourselves.

When you think in terms of a decentralized economy and society, really exciting things can start to happen. When people around the world become owners of their own information, this can be a catalyst to a new set of business models allowing completely new ways to interact. There are many different approaches to create the future of Self-Sovereign Identity, that might also converge over time to be more compatible, like uPort on Ethereum, Veres One, or Sovrin (a contraction of Sovereign) or Hyperledger Indy on which Evernym is building its solutions as an example.

### *Why is Self-Sovereign Identity important?*

Our physical environments are becoming more interconnected and intelligent. We are getting intelligent cars, homes and shopping experiences depending on the person accessing a service as part of the custom-made economy, in which we will be interacting and authorizing actions with our Self-Sovereign Identity.

In this new digital identity model facilitated by Self-Sovereign Identity two challenges will be solved: reputation and risk. Risk will be managed directly because people around the world will be able to share anonymized information for health, credit or other services controlling how information is shared allowing to apply an intelligence layer to it. Self-Sovereign Identity could also allow for the creation of decentralized reputation models to establish trust in the Peer-to-Peer economy. Here are some examples:

### *Login and E-commerce with Self-Sovereign Identity*

In the future, we might not have to use centralized authorization services to access the Internet such as Twitter, Google or Facebook. Instead we will use our Self-Sovereign Identity to validate our identity without having to rely on third parties, e.g. by using a mobile device. This will allow us to use our "real identity" or a pseudonym, depending on the context, knowing when to allow those services to monetize our information when needed. E-commerce might become a flat world where the big players e.g. Amazon or Alibaba will have to compete with other ecommerce players equally because authorization and payments could be natively digital as part of your Self-Sovereign Identity in a P2P economy as proposed by decentralized protocols like Open Bazaar.

### *Banking with Self-Sovereign Identity*

Banks are under ever more scrutiny from regulators as part of KYC (Know-your-Customer) and AML (Anti-money-laundering) processes, therefore they need to fulfill increasing costs urgently. Because of this pressure, financial institutions around the world are exploring solutions to help their clients to transport their identities from one bank to another. This will allow any bank to benefit from the previous KYC and AML work done by a previous bank in the same recognized jurisdiction. While they understand that this lowers their customers' switching cost, their plan seems to be to compete increasingly through enhanced product and service quality. At the same time, regulators are positive about this and are producing more regulation that supports the trend as the EU is currently doing with PSD2, GDPR and MiFID2.

### *Health data with Self-Sovereign Identity*

Similar to the web, our health information is also distributed in various silos. Self-Sovereign Identity aspires to make us the owners of all our health information, to be able to choose whom we give further access, and allow us to have access to our own information whenever we may need it. In the future, this should allow a doctor or hospital access to our data whenever we want them to. This method could even be used to help develop new medicines without putting our privacy at risk. Our smart watch could measure our pulse and blood pressure in real time and we could decide to donate or sell this information for scientific purposes or in exchange for products and services.

This is just a selection of an infinite number of potential use cases. In our next articles we will explore the precedents and models that have been tried and tested in the Digital Identity world before we could start dreaming about combining Blockchain and Digital Identity to get to Self-Sovereign Identity. In our upcoming

articles we will do a deep dive into the history of Digital Identity with the following key phases: centralized identity model, federated identity model, and user-centric identity model.

The future of identity will be a return to identity as defined by the web of trust that links all humans. To fully understand where we are going with Self-Sovereign Identity, we need to know where we are coming from.

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