Cryptocurrencies and tokenization

Overview and opportunities arising from the use of digital currencies and other tokenized assets

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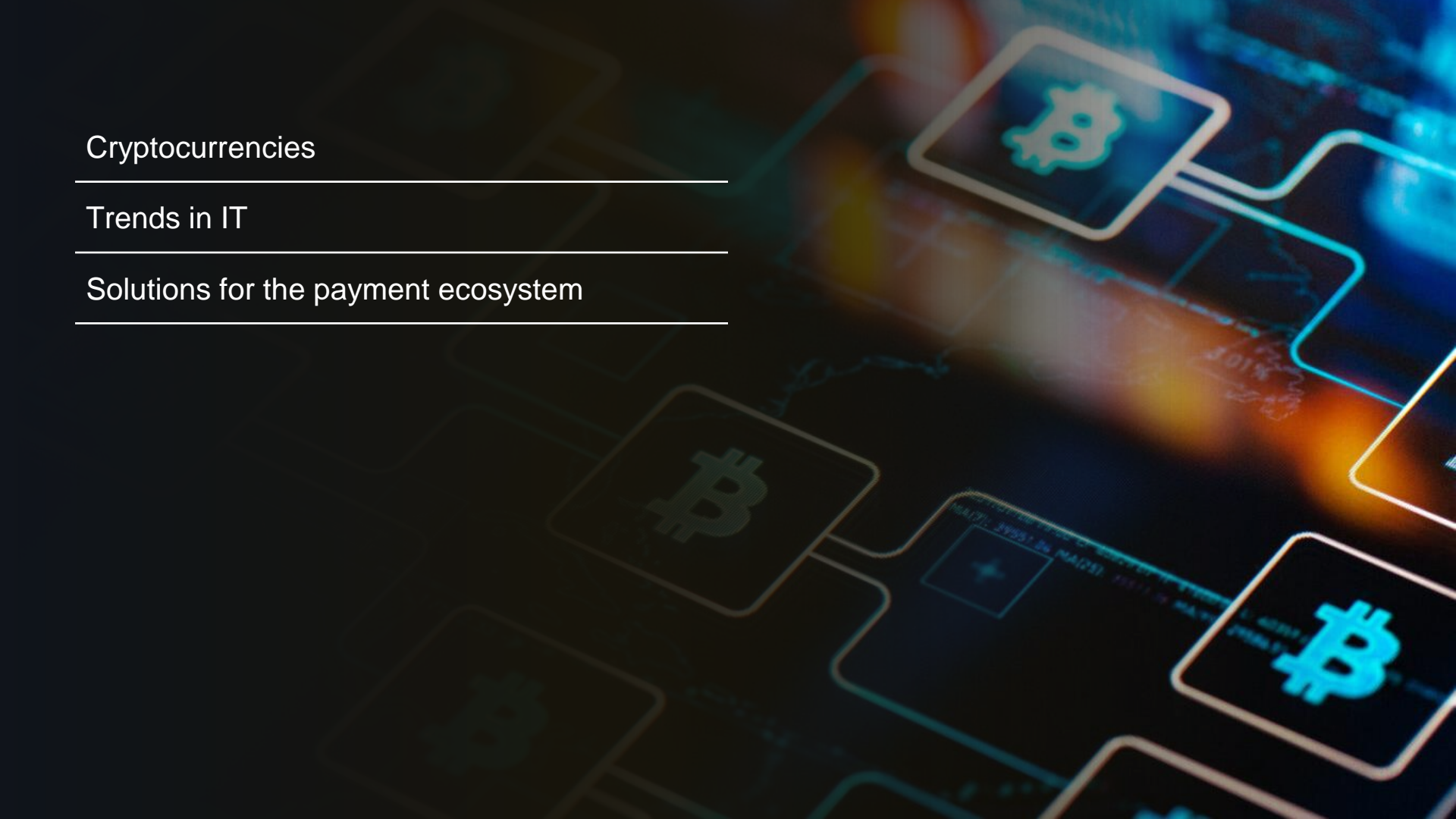
Cryptocurrencies

Trends in IT

Solutions for the payment ecosystem

1. Context of the cryptocurrency market

The market related to the digitization of assets has boomed in recent years and presents itself as an opportunity for the future. Cryptocurrencies were the origin of all these assets.

Market capitalization

Source CoinMarketCup

- The market capitalization of all cryptocurrencies is over one trillion US dollars, with Bitcoin, Ethereum, Tether, Ripple and BNB leading the top 5. USDT being part of the so-called *stablecoins* (cryptocurrencies linked to a hard fiat currency), ETH as the first altcoin or BNB created and integrated into the Binance Exchange.

- We come from an unregulated framework with major scandals in the sector that has pushed government agencies to develop a new regulatory framework called MICA in Europe and which is underway in most countries, as for example in Colombia (Sandbox Arenera) where progress is being made in the regulation or Brazil which is taking steps forward as one of the references. A preliminary comparison of the different countries shows that the regulations do not differ greatly from one continent to another.

1.1 Cryptocurrencies: some basic concepts

Cryptocurrencies are digital or virtual currencies that, unlike conventional or fiat currencies (EUR, USD, GBP, etc.), are not issued by a central authority.

How did it all start? The Bitcoin

✓ The first cryptocurrency was **Bitcoin** (created in 2009). There are now **more than 10,000** cryptocurrencies in circulation.

✓ We can **know the price** of each cryptocurrency on the exchanges, as if it were a stock.
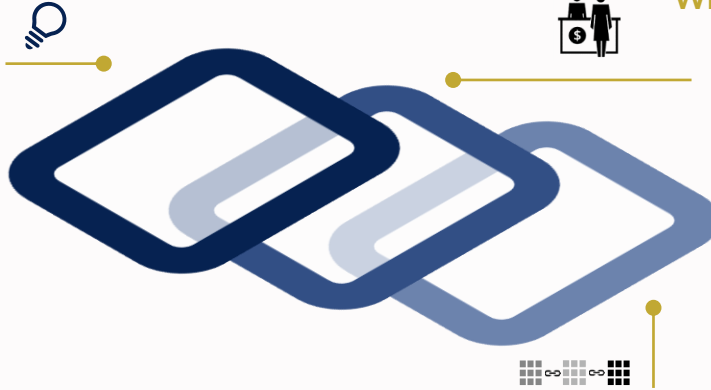
What else should I know?

✓ There are several types of cryptocurrencies, but some of the most relevant for the financial sector are **stableCoins** (cryptocurrencies linked to a strong fiat currency, where there can be a central authority behind it, or to any asset that facilitates price stability - even with an algorithm to maintain it).

✓ The **legality** of cryptocurrencies and the services provided by players depends on each country, but there are fewer and fewer countries where they are banned.

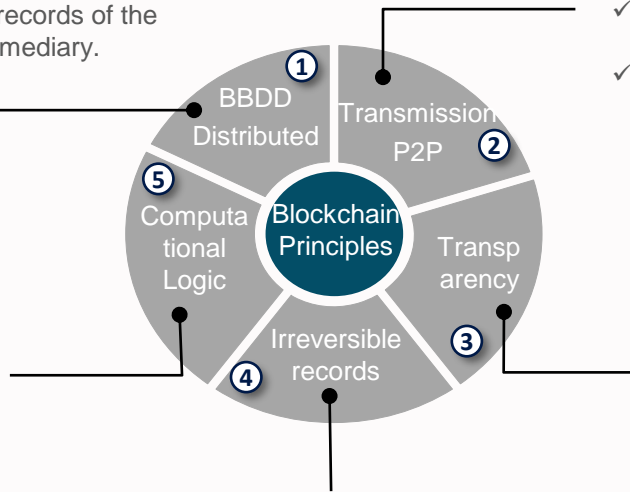## What can cryptocurrencies be used for?

✓ As a **means of payment**:
  • to make a transfer,
  • buy goods and services from merchants (many companies are issuing their own crypto, which can be used to buy from the merchant itself - like chips in a casino),
  • as part of the payroll,
  • as payment of taxes...

✓ As an **investment or speculation**, its price follows the law of supply and demand. Remember that there is no central authority backing the currency, so there is no guarantee of its liquidity.

✓ As **financing or incentive** for a digital project, where the main motivation is not the purchase/sale of the cryptocurrency but the project itself, and this is fed by the payment made through cryptocurrencies.

1.2 Cryptocurrencies: Blockchain the Underlying Technology (1/3)

The underlying technology is the Blockchain, a distributed and decentralized database based on cryptographic algorithms that contribute to data protection and privacy.

✓ **Each Blockchain node has access to the entire database** and its complete history.
✓ No one controls the data or the information.
✓ All nodes can verify the transaction records of the participants directly, without an intermediary.

✓ **Communication occurs between users rather than through** a centralizing node.
✓ Each node stores and redirects the information to the other nodes.

✓ Transactions can be linked to **computational logic and programmed (Smart Contracts)**.

① BBDD Distributed
② Transmission P2P
③ Transparency
④ Irreversible records
⑤ Computational Logic

Blockchain Principles

✓ All transactions and their associated value are **visible to any user**.
✓ Each node or user has an alphanumeric address of more than 30 characters.
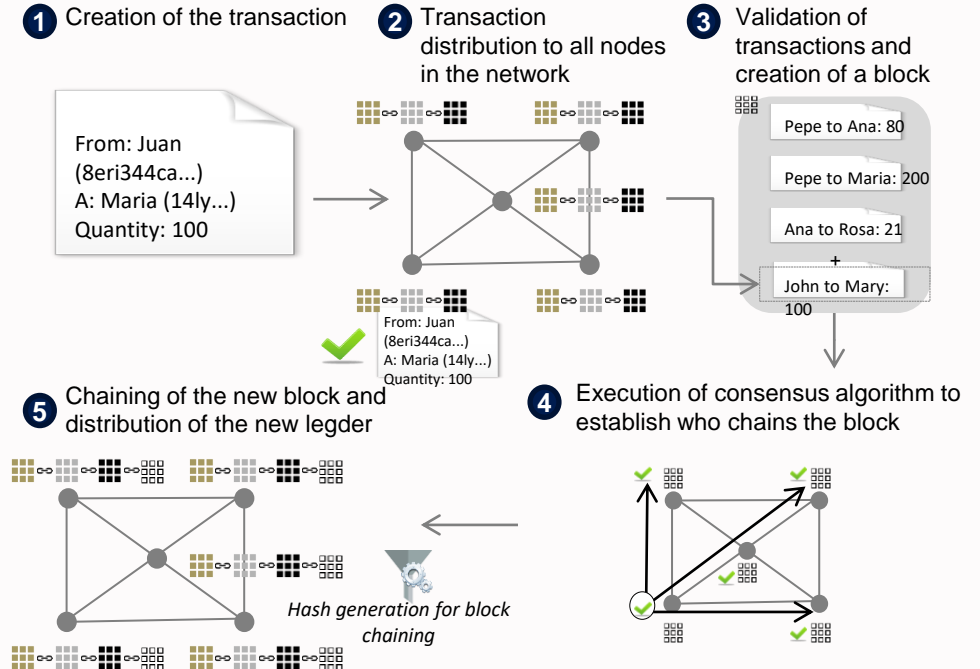✓ Users can choose to remain **anonymous or provide evidence of their identity**.

✓ Once the transaction has been entered **it is not possible to modify it**.
✓ The DB register is permanent, chronologically ordered and available to everyone on the network.

1.2 Cryptocurrencies: Blockchain the Underlying Technology (2/3)

The underlying technology is the Blockchain, a distributed and decentralized database based on cryptographic algorithms that contribute to data protection and privacy.

- ✓ **Registration of any asset:** *cryptocurrencies*, financial instruments, commodities... o **Smart Contracts**: programmable contracts that implement business rules and whose code is registered and can be executed in a distributed way by the different nodes of the network.

- ✓ **Immediacy of operations,** since they are confirmed as soon as they are registered.

- ✓ **Security and privacy, through** cryptographic rules that allow for the inviolable registration of transactions and secure authentication of participants.

- ✓ **Transparency,** since all operations are recorded and can be audited by any member of the network.

- ✓ **Elimination of a single point of failure,** because if one node is compromised, the rest of the network remains.

- ✓ **Cost reduction,** since **the intermediation** (*peer to peer* operation) performed by a third party to validate and register operations **is eliminated.**

Blockchain: Protocol steps

1 Creation of the transaction

From: Juan (8eri344ca...)
A: Maria (14ly...)
Quantity: 100

2 Transaction distribution to all nodes in the network

From: Juan (8eri344ca...)
A: Maria (14ly...)
Quantity: 100

3 Validation of transactions and creation of a block

Pepe to Ana: 80

Pepe to Maria: 200

Ana to Rosa: 21

+

John to Mary: 100

5 Chaining of the new block and distribution of the new legder

Hash generation for block chaining

4 Execution of consensus algorithm to establish who chains the block

1.2 Cryptocurrencies: Blockchain the Underlying Technology (3/3)
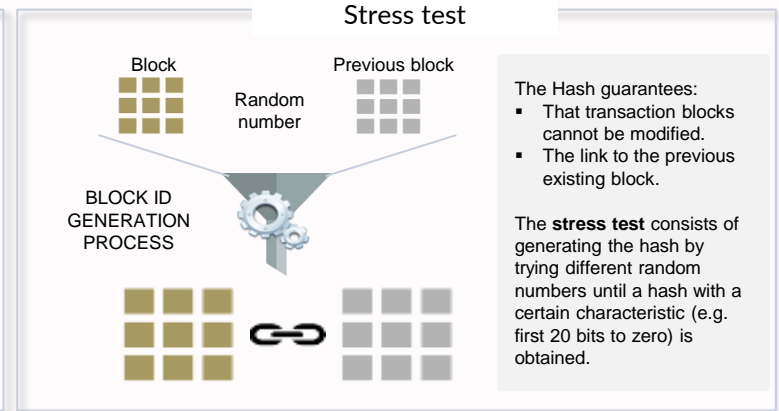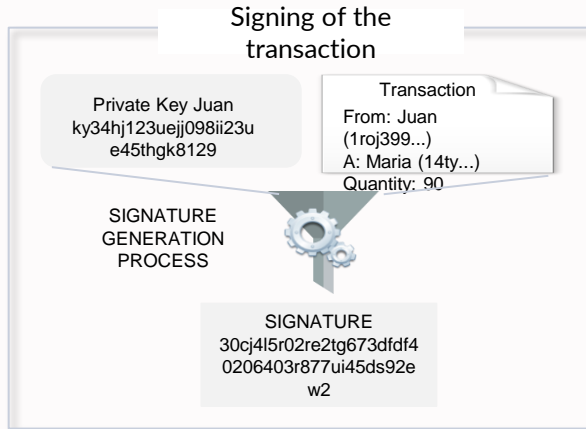
The underlying technology is the Blockchain, a distributed and decentralized database based on cryptographic algorithms that contribute to data protection and privacy.

Blockchain operation is based on functions called *Hash*, used both in the transaction signature authentication process and for stress testing.

Asymmetric *hashes* are algorithms that manage to create, from an input, an alphanumeric output of fixed length that represents a summary of all the information.

Features

1. From the input data it creates a string that can only be recreated with the same data (two different inputs produce two different hashes - collision resistance).
2. From the generated hash it is not possible to know what the original data was.

BLOCKCHAIN ACCOUNT

Account number
Public key
1rojf399dfj1kiek3l01yy0233492

PIN
Private Key
ky34hj123uejj098ii23ue45thgk8129

Signing of the transaction

Private Key Juan
ky34hj123uejj098ii23u
e45thgk8129

Transaction
From: Juan
(1roj399...)
A: Maria (14ty...)
Quantity: 90

SIGNATURE
GENERATION
PROCESS

SIGNATURE
30cj4l5r02re2tg673dfdf4
0206403r877ui45ds92e
w2

Stress test

Block   Random   Previous block
               number

BLOCK ID
GENERATION
PROCESS

The Hash guarantees:
- That transaction blocks cannot be modified.
- The link to the previous existing block.

The **stress test** consists of generating the hash by trying different random numbers until a hash with a certain characteristic (e.g. first 20 bits to zero) is obtained.
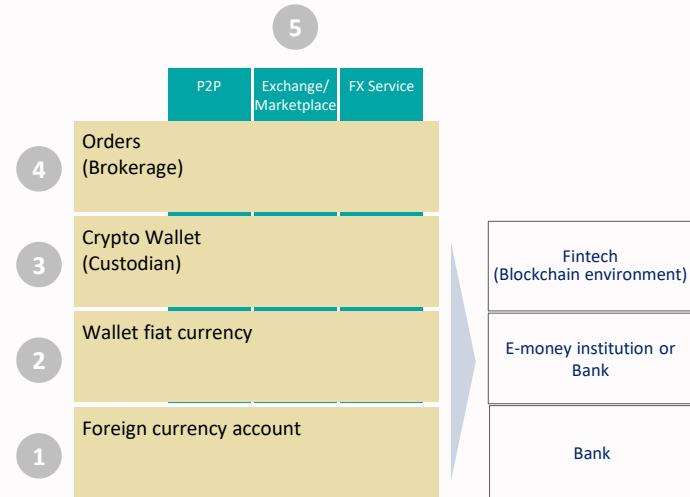
1.3 Cryptocurrencies: Basic elements

The basic elements for trading cryptocurrencies are the digital wallet with fiat currency, the digital wallet that will hold the cryptos and the set of orders sent to exchanges, P2P environments or service networks.

In the following pages, we describe the basic activities that can be performed with cryptocurrencies. To do this, we divide the map into **five conceptual blocks** that will help to understand the **basic elements** involved in the processes:

1. **Fiat Currency Account**: this is the **current account** in EUR, USD, GBP... that we have opened with the bank. It is necessary to fund the fiat currency wallet.

2. **Fiat Currency Wallet**: is a **digital wallet** that will be funded/unfunded from the current account. In order to provide the digital wallet service it is necessary to be established as an e-money institution or be a bank.

3. **Cryptocurrency Wallet**: this is the **wallet** that will contain (store) the **cryptocurrencies**. Depending on the country, the legal form required to be able to offer this service changes (see section on Regulation).

4. **Orders**: conceptually, we group here the **set of orders and requests** that will be launched related to cryptocurrency activities (I want to buy, I want to sell, I want to pay for a service, etc.).

5. **Arena:** These elements interact in an **exchange, in a P2P environment, or in a network** where a certain **service** is offered (e.g., fiat-crypto exchange rate).

	P2P	Exchange/ Marketplace	FX Service
4 Orders (Brokerage)			
3 Crypto Wallet (Custodian)			
2 Wallet fiat currency			
1 Foreign currency account			

Fintech (Blockchain environment)
E-money institution or Bank
Bank

5

View license differences

1.3 Cryptocurrencies: Conceptual Process Map (1/2)

The basic elements for trading cryptocurrencies are the digital wallet with fiat currency, the digital wallet that will hold the cryptos and the set of orders sent to exchanges, P2P environments or service networks.
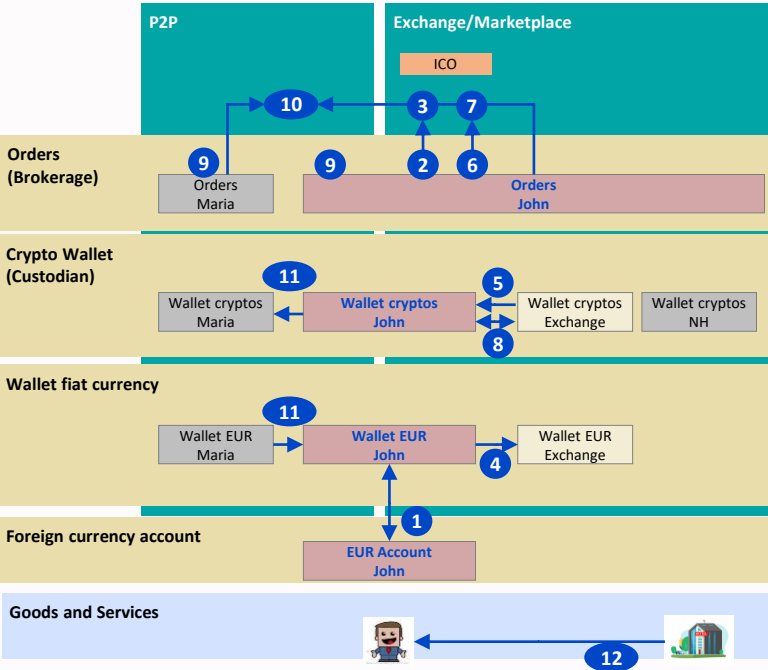
Funding of fiat currency wallet
1- The fiat wallet is funded from the traditional bank account by the usual means of payment: transfer, card, etc.

Buy/sell bond-crypto in an Exchange
2- The order is launched with the amount of the desired crypto. It can be at a certain price or at the best market price. The exchange can set limits to the value of the orders according to several criteria (type of account, buyer profile...).
3- The exchange receives the order and executes it according to the indicated criteria. There can be partial or total executions.
4- When the order is executed, a debit will be recorded in the virtual cash of the buyer's wallet and a credit in the wallet/account of the exchange. In case of orders at a given price, the fiat is retained in the wallet at the same time the order is placed (to avoid leverage - see point 19).
5- The desired crypto will be registered in the buyer's crypto wallet and unregistered from the exchange wallet.

Buying/selling crypto-currency on an Exchange
6- Similarly, the buyer can exchange the cryptos in his wallet for other cryptos (some cryptos can only be bought with other cryptos, never with fiat). The order is sent to the exchange.
7- The exchange receives the order and executes it according to the indicated criteria. There can be partial or total executions.
8- When the order is executed, the amount of crypto purchased will be recorded in the buyer's crypto wallet and the amount will be deregistered from the exchange wallet.

**Fiat-crypto or crypto-crypto P2P buying/selling**
9- In the case of a P2P environment, the same transactions can be carried out between the members of the environment, without the need to resort to an exchange. Orders are placed (at a given price or at the market).
10- An algorithm collects the orders and when there is a matching (partial or total) it executes them.
11- When the order is executed, the relevant entries are made in the wallets.

1.3 Cryptocurrencies: Conceptual Process Map (2/2)

The basic elements for trading cryptocurrencies are the digital wallet with fiat currency, the digital wallet that will hold the cryptos and the set of orders sent to exchanges, P2P environments or service networks.
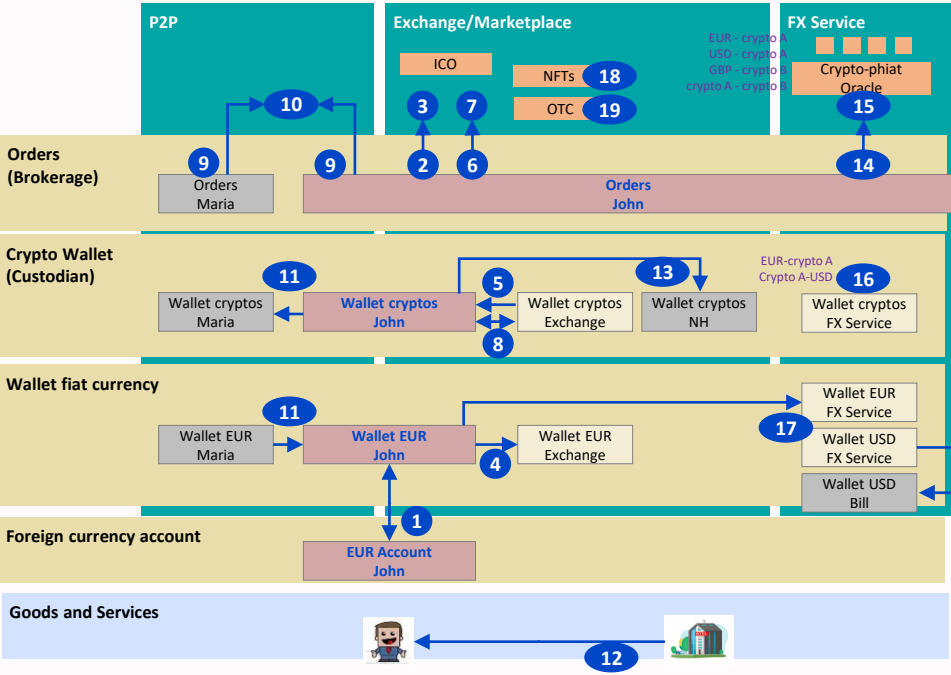
Payment in crypto trading

12- There are businesses that already accept cryptocurrency payments. In the transaction, the consumer will receive the good or service and will be able to choose among the payment options determined by cryptocurrencies. A dynamic QR code with the transaction price can be used to initiate the transaction.

13- When the payment is executed, cryptos will be unregistered from the consumer's wallet and registered in the merchant's wallet.

International payment (FX services)

14- Without the need to have a crypto wallet, you can use services that use cryptos to make currency transfers. The amount of currency to be sent and the recipient are communicated.

15- The order is received and according to the network: a) an algorithm (oracle) connected to different crypto-phiat or crypto-crypto price providers will look for the best conversion, or b) the best conversion will be given according to the network's own prices (according to internal supply and demand).

16- The necessary fiat-crypto or crypto-crypto exchange will be executed in order to execute the payment desired by the client. The service will act as an FX treasury.

17- A debit will be recorded in the virtual cash of the payer's wallet and a credit in the virtual cash of the payee's wallet, in the corresponding currency.
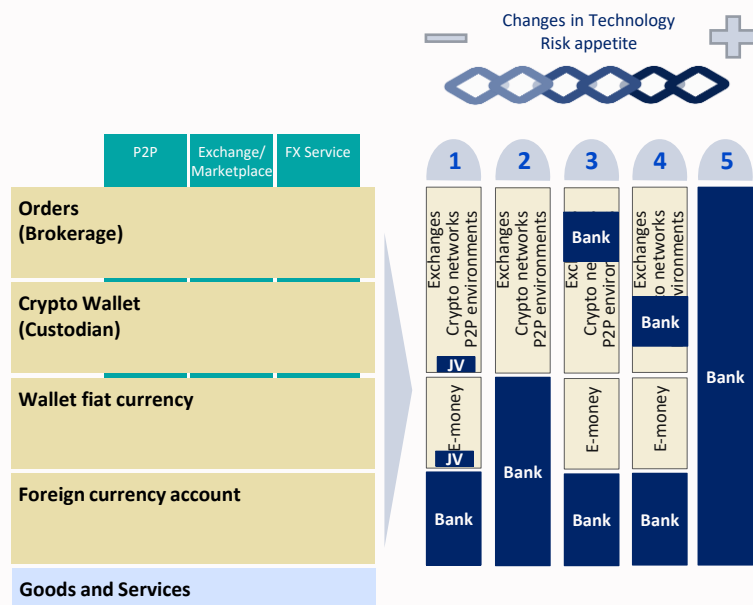
Buy/sell crypto-NFT

18- Cryptos can also be exchanged for non fungible tokens (NFT), which are unique and linked to digital assets (e.g. a digital artwork or a song), and whose ownership is recorded on the Blockchain.

OTC and other financial transactions with cryptos

19- Thinking of crypto as a currency and as an asset, the same type of usual financial operations can be made, for example: derivatives on cryptos (whether you own the crypto or not, e.g. a CFD), deposits (staking: you lend the crypto for a term and they give you an interest in the borrowed crypto or in another one), fiat-crypto leverage (borrowing in fiat to buy more cryptos, hoping to pay back the loan with the result of the sale of the cryptos) or crypto-crypto, etc. Additionally, from a crypto wallet, there are investment apps that allow you to acquire traditional financial assets (stocks, etc.).

1.3 Cryptocurrencies: Opportunities for the financial sector

Depending on the appetite of each entity, different opportunities are identified with different levels of involvement, both from the point of view of technology and the risk to be assumed.

Changes in Technology
Risk appetite

	P2P	Exchange/ Marketplace	FX Service
Orders (Brokerage)			
Crypto Wallet (Custodian)			
Wallet fiat currency			
Foreign currency account			
Goods and Services			

1 - Maintain the conventional account and work through Joint Ventures with the other players:
- ✓ Agreements with exchanges or electronic money institutions to offer faster or more attractive commissions when funding the fiat wallet (by card or transfer). With this, the entity would boost the attraction of new clients (crypto investors are willing to open a new account because of the facilities offered in relation to cryptos).
- ✓ Issuance of the entity's cards associated to an exchange, so that the customer can take advantage of the cashbacks offered (usually in the crypto of the exchange), and the entity earns the commissions from the use of the card, as well as new customers (exchanges are gaining a lot of share thanks to this).

- • Swipe
- • Mortgage Bank
- • Qredo
- • Restalia
- • Tesobe

2 - Fiat wallet service: offer the fiat wallet, earning the commissions from this service, in addition to control over the speed of funding.

- • CaixaBank
- • Revolut
- • BNext

3 - Offer different services to your customers by participating in a network, for example:
- ✓ FX Service: without the need for its clients to have cryptocurrency wallets, the entity can offer the service of payments in foreign currencies at better prices and faster than what its FX desk at the Treasury can offer. To do so, the entity must have access to a network that provides this service.
- ✓ Intermediation service in the purchase/sale of fiat-crypto, crypto-crypto or payment in stores: to give clients access to a network to carry out these activities, with the entity obtaining a commission for intermediation.
- ✓ Deposits with higher returns through stableCoin: for each hard fiat currency there is a crypto referenced to the fiat price (lower risk than other cryptos). Banks can offer deposits with better returns if they make investments in stableCoins, keeping a % of the return.

- • Santander
- • BBVA
- • Ripple

4 - Custody of crypto wallets: taking advantage of their reputational advantage, entities can be custodians of their clients' crypto wallets (with the necessary investments in security against hacker attacks), obtaining commissions from this service, as well as attracting new clients.

- • BBVA
- • Prosegur Crypto

5 - Create its own crypto and control the entire ecosystem: the entity would benefit from all the commissions, opening multiple utilities: pay part of the employees' payroll in cryptos, facilitate payment in stores, offer discounts on products when paying with the entity's crypto...

- • JP Morgan

2. Other digital assets: Product typologies

On the basis of blockchain technology, products that were previously traded in a more traditional way have been digitized and new products are also emerging.

Central banks are currently threatened by cryptocurrencies and stablecoins, which has led them to the debate on whether or not to create so-called **CBDCs (Central Bank Digital Currency)**.

These digital currencies will make it possible to compete against cryptoassets and provide traditional banking with greater competencies.

The possibilities of digitization of non fungible goods have created a new market, encompassed as a **NFT (non fungible token)** product.

Based on blockchain technology, it has a great boom and a world of possibilities.

From art to buildings of pharaonic construction is in the scope of this transformation.

With blockchain it has been possible to digitize traditional products such as: **Bonds, ETFs or Structured Products**.

These new products have advantages over traditional banking due to cost savings and the possibility of fragmentation.

Expanding the product catalog to include them is key to customer service.

With the current adoption, different financial products and services have been created, creating a new environment of decentralized finance called **DEFI.**

In this environment clients do not require a traditional bank, since most products are offered in parallel within DEFI using cryptocurrencies, with higher interest and profits for the client.
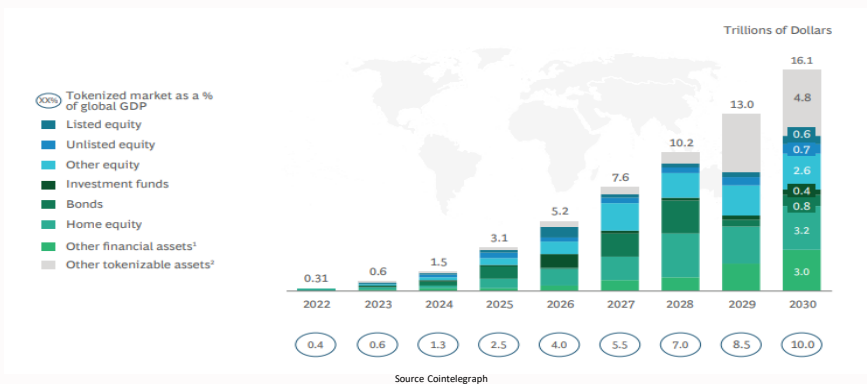
2.1 Other digital assets: The market for tokenization

The market related to the digitization of assets has boomed in recent years and is presented as a future opportunity thanks to tokenization.

Market volume tokenization

Trillions of Dollars

Legend:
- XX% Tokenized market as a % of global GDP
- Listed equity
- Unlisted equity
- Other equity
- Investment funds
- Bonds
- Home equity
- Other financial assets[1]
- Other tokenizable assets[2]

Source Cointelegraph

- The digitization or tokenization of traditional products is a market with great potential. The World Economic Forum estimates that around 10% of global GDP will be stored and transferred via DLT by 2027.

- Additionally, the WEF also believes that tokenized markets could potentially be worth up to $24 trillion by 2027.

- In Europe, these cryptoassets, similar in nature to traditional securities, issued using blockchain technology, are known as security tokens, and, for the time being, are regulated under MIFID II. However, one of the objectives of the Pilot Regime is to explore DLT-based infrastructures for the issuance, trading and settlement of this type of cryptoassets and to adapt the regulation based on the results obtained upon completion.

2.2 Other digital assets: CDBCs

CBDC refers to Central Bank digital currencies, denominated in the national unit of account, which represent a liability for the Central Bank.
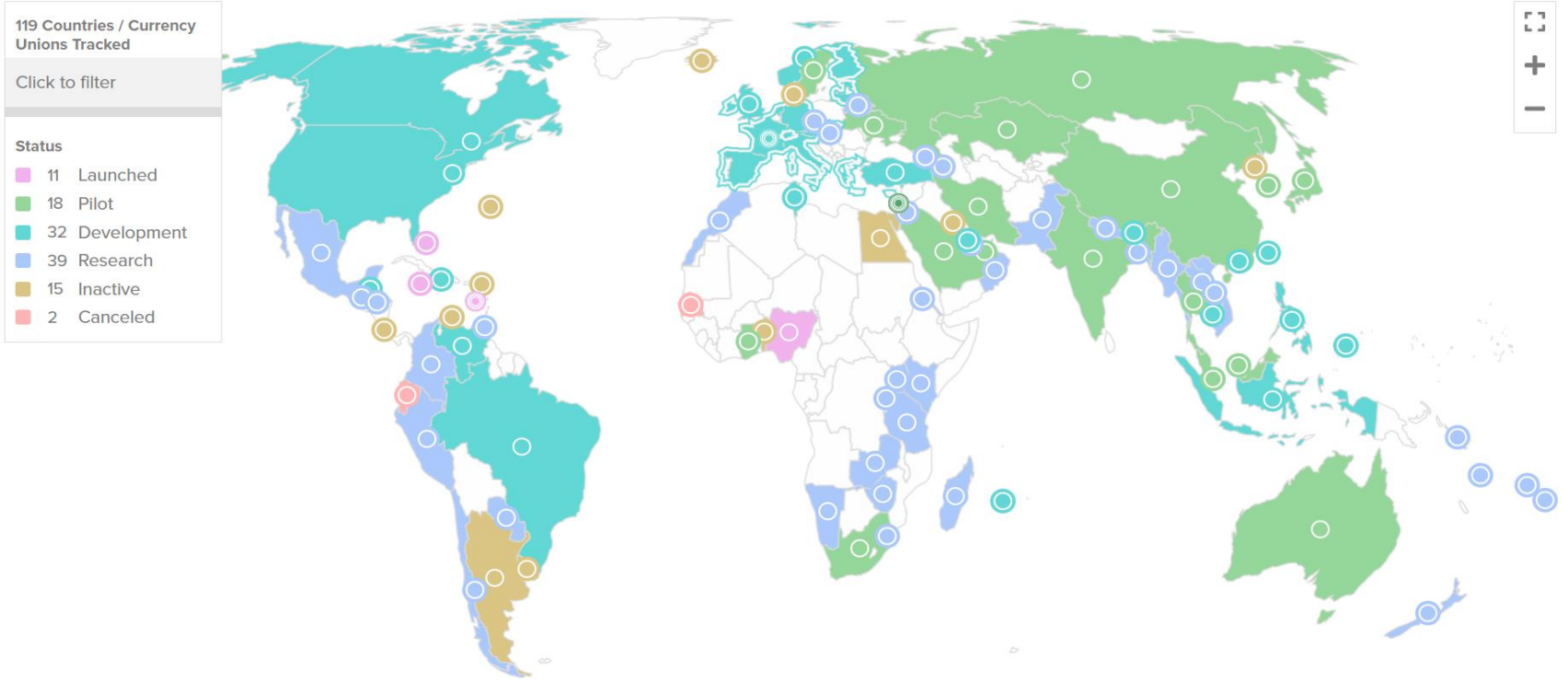
What are CBDCs?

- CBDCs are **digital currencies issued and backed by the Central Banks of each country, which emulate the fiat currency of the country where they circulate**.

- CBDCs differ from existing digital money available to the general public because **a CBDC constitutes a liability of the Central Bank**, not a commercial bank.

- Although CBDCs also operate under a blockchain, unlike other cryptocurrencies such as Bitcoin, they usually do so on **private networks that are controlled by a central authority.**

- In this way, **central banks could control the issuance of CBDCs and the monetary policy with which their national currency is governed.**

- The main motivation for their development is **the improvement of the payment system**, in a current scenario marked by the **increase in electronic payments and the decrease in the use of cash**. However, **the creation of unregulated private electronic payment instruments, such as stablecoins**, has also driven their development in view of the risk they may pose to financial stability.

The threat to fiat money: stablecoins

- What are known as **stablecoins or 'stable cryptocurrencies'** are considered tokens that are linked to the value of a fiat currency (such as the dollar or euro), tangible assets such as gold or real estate, or another cryptocurrency.

- Stablecoins **emerged primarily to try to reduce the volatility of cryptocurrencies** and differ from CBDCs, among other things, because they are issued by private institutions rather than Central Banks.

- The **growing interest of Central Banks in CBDCs** arises in response to the popularity of these stablecoins issued and controlled by private institutions.

- **Each CBDC may operate uniquely and use a different technology**, depending on how it has been implemented by the relevant Central Bank. However, the model used by stablecoins is being studied for implementation in the development of CBDCs.

2.3 Other Digital Assets: CDBCs - Global Scenario

According to the Atlantic Council, 114 countries, representing 95% of the world's GDP, are exploring CBDC development.

119 Countries / Currency Unions Tracked

Click to filter

Status
- 11 Launched
- 18 Pilot
- 32 Development
- 39 Research
- 15 Inactive
- 2 Canceled

Source: Central Bank Digital Currency Tracker - Atlantic Council

2.4 Other digital assets: CDBCs - Regulation

At present, there is still no specific regulation governing the issuance and distribution of CBDCs; however, all countries are working on the development of such regulations.

Global situation

In recent years, different international organizations such as the Bank for International Settlements (BIS), the World Bank (WB) and the International Monetary Fund (IMF) have issued different recommendations on CBDCs, considering that their issuance requires international cooperation and coordination.

EU

In the European Union, the Digital Euro falls outside the scope of the MiCA Regulation, which regulates the issuance of so-called *Utility tokens*, *Asset-Referenced tokens* and *E-money tokens and the* DLT/MiFID II regulation, which regulates digital assets considered as financial instruments, Security tokens. For this reason, on June 28, 2023, the Commission presented the legal framework for the possible introduction of the digital euro as part of its "Single Currency Package".

USA

The USA is another country exploring the potential benefits and associated risks of issuing and distributing its CBDC. At present, no final decision has yet been made on the matter, but Federal Reserve System Chairman Jerome Powell testified before the US House Financial Services Committee in March 2023 that CBDC is "something we would certainly need congressional approval for."

Brazil

In terms of regulation, Brazil has not yet developed a specific regulation on CBDC. However, the Brazilian Securities Market Commission (CVM) has published *Parecer de Orientação CVM 40,* an opinion that has the character of recommendation and guidance to the market about asset tokenization. On the other hand, on June 20, 2023, the Cryptoassets Regulatory Framework that regulates the provision of virtual asset services and virtual asset service providers (VASPs) in the country will come into force.

3. Digital Euro: What does it consist of?

The ECB's initial proposal is to create a digital Central Bank currency, the electronic equivalent of cash, which would provide eurozone citizens with an additional option for their payments.

What is it?

- The digital euro is an electronic form of Central Bank money that all citizens and businesses could use to make their daily payments quickly, easily and securely, as if they were coins or banknotes, but in digital format. Therefore, the digital euro would be a complement to cash, not a substitute.

- Since it would be Central Bank money issued by the ECB, it would be distinct from "private money", but **a card or** mobile **app could also be used to pay with digital euros** (at no cost to individuals when making ordinary payments and can be used anywhere in the euro area).

- The European Central Bank (ECB) is currently working with the national central banks of the euro zone to study the advisability of introducing a digital euro.

Current status

- In October 2020, the ECB published a report examining the possible issuance of a digital central bank currency denominated in euros, and initiated in July 2021, the research phase of the digital euro project, which covers key issues related to the design and distribution of a possible digital euro and includes a prototyping exercise.

- To date, the ECB has published four progress reports on project objectives and "foundational design options" that have been approved by its Governing Council.

- On June 28, 2023, the Commission presented legislative proposals on the digital euro, as well as on the legal tender status of euro banknotes and coins.

- A final decision on the overall design for the digital euro, which will include all the options and design elements put forward by the Eurosystem, is expected in the last quarter of 2023.

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