



**PROGRAMMABLE
PRIVACY
FOR
THE METAVERSE**

Program your privacy on a SoulBound Token.

Photochromic ID provides persistent, verifiable identity on the blockchain to enable safe, secure online interactions.

Your digital passport to the Metaverse.

This document has been prepared for information purposes only and does not constitute an invitation, advice, or solicitation of an offer to acquire Photochromic products or tokens.

Contents

Credits	4
The Problem	4
Photochromic Protocol: Overview	4
Design Principles	5
Why Photochromic?	5
Technical Specifications	6
Building Blocks of the Beta product	7
Protocol Revenue	8
Tokenomics	10
The Roadmap	12
The PhotoSapiens	14
Genesis Edition	14
Soulbound Edition	14
Parting Words	15

Photochromic is an ongoing project. We are constantly evolving and updating our thinking in line with feedback from our community and partners. This Whitepaper reflects our current thinking and will be updated without versioning as and when the product evolves.

Credits

This Whitepaper is prepared in collaboration with the community and partners of Photochromic. All credit to the community and partners in driving the Photochromic protocol forward. In true homage to a decentralized community, this Whitepaper is owned by all.

The Problem

The internet was built without an identity layer^[1]. Many technological advancements recently have resulted in open standards that have made significant headway to address this problem.

That said, identity still largely remains contextual, constrained within centralized ecosystems or platforms without the ability to leverage the data or identity across multiple ecosystems or platforms.

Simply put, the persistent components of our identity are not portable.

Photochromic Protocol: Overview

Photochromic programs privacy using soulbound tokens (“**SBT**”) for portable Self-Sovereign Identity (“**SSI**”) on the Metaverse (“**Photochromic ID**”).

Powered by an ERC-20 token, Photochromic provides programmable, verifiable identity in the Metaverse, facilitating the portability of identity.

As the world steps into the Metaverse, Photochromic leverages blockchain, NFTs, smart contracts and biometrics to provide unprecedented verification, authentication and portability, surpassing what is possible in the real world.

A Photochromic ID is a portable passport, providing a universally verified identity, which gives you an all-access pass to the Metaverse.

Design Principles

Photochromic is designed to be:

User-centric:

- **Reusable:** The Photochromic ID uses a verification status surfacing the underlying data repeatedly.
- **Extensible:** The user decides has full ownership and control of their data, including the data shared and with which counterparty.

Decentralized:

- **Permissionless:** There is no centralized intermediary to moderate data flow, the user is empowered with ownership and control over their identity and data in keeping with SSI.
- **Interoperable:** In due course, the Photochromic ID will be extended to other chains, while maintaining privacy and ensuring that the user retains full control over their personal data.

Secure:

- **Private:** The Photochromic ID enables a user to verify their identity without exposing personal data.
- **Data minimization:** The data, which is used to create the verified identity of the Photochromic ID, lives off-chain, but the utility provided is on-chain.
- **Compliant:** A Photochromic ID complies with international regulations and standards for data privacy.

Why Photochromic?

The term, “Photochromicity,” describes the ability to adjust transparency to a certain stimulus. In sunglasses, exposure to sunlight reduces transparency. Through a smart contract, the project embraces a “Photochromic” nature. The user decides the level of transparency when engaging with other people and businesses. Selective data sharing empowers the self-sovereign individual to manage and control their own data.

Technical Specifications

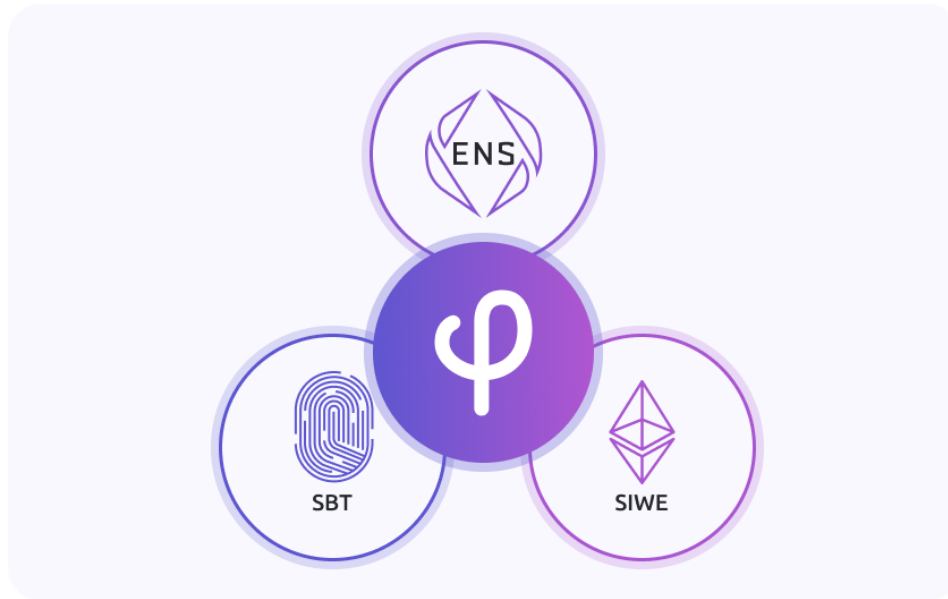
Photochromic is powered by Ethereum standard tokens:

- ERC-721 token, which is as a Non-Fungible Tokens (“**NFT**”) representing a certain identity; and
- ERC-20 \$PHCR as a means of governance.

Photochromic leverages:

- **ENS:** ENS is a distributed, open, and extensible naming system that is evolving towards an open standard for multi-chain name and address resolutions, secured by Ethereum. It brings human readable names and metadata to web3, like the Domain Name System (“**DNS**”) for internet addresses. ENS is an extensible system that enables integration with open protocols or web2 platforms like Twitter. Photochromic builds upon ENS to provide programmatically verifiable identities for a multi-chain Blockchain future, which will in turn enable other developers to build upon the identity protocol and facilitate the portability of identity^[4].
- **SBT:** By design, NFTs are unique, unmodifiable digital assets that can contain a variety of data, including images, metadata, or identification data. Photochromic builds on ERC721, the leading standard for NFTs, and allows for integration in a dApp or trading on marketplaces, including LooksRare, OpenSea or Rarible. Using the chain agnostic addressing scheme for NFTs (CAIP-19), Photochromic identities can be referenced in a standardized format. A SBT is a subcategory of NFT, in that the NFT is unique to a person rather than unique to a certain digital art collection^[2].
- **SIWE:** SIWE enables users to take control of their digital identity by using an Ethereum account and an ENS profile. This is in direct contrast to a centralized or traditional intermediary which controls the profile and data of the user. SIWE is a collective effort to standardize verification in a decentralized manner, enabling the user to take full control and ownership of their data and digital identity.

Figure 1: Photochromic merges ENS, SIWE and SBT

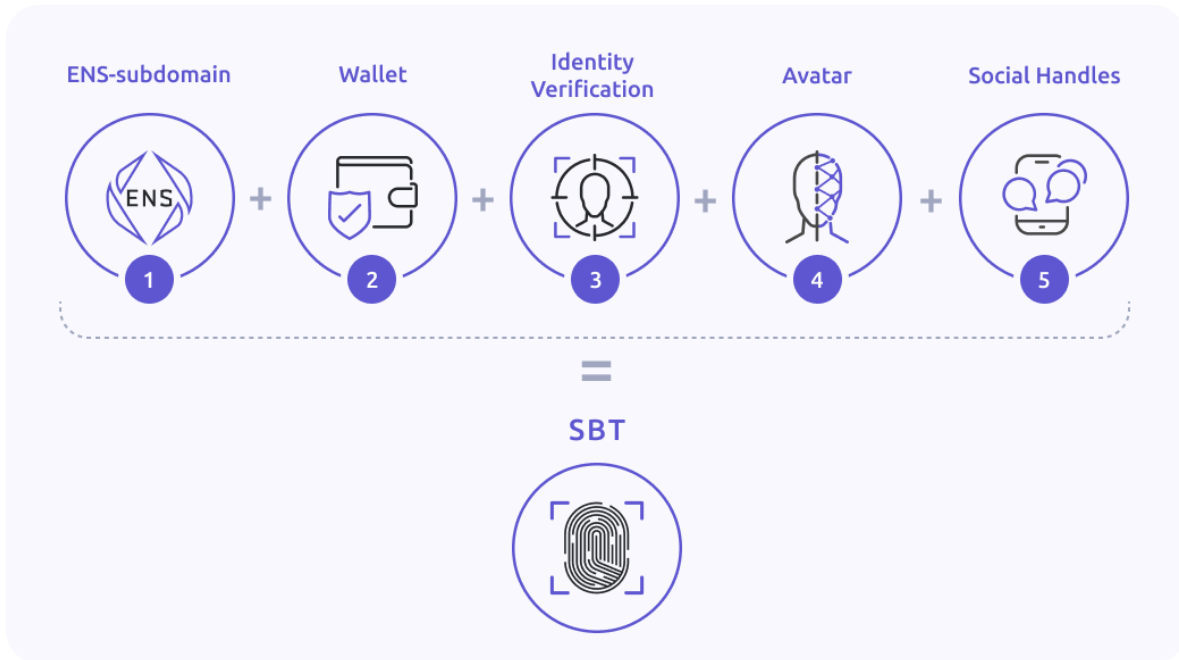


Building Blocks of the Beta product

Photochromic comprises:

- **Integration with ENS:** Photochromic leverages ENS, providing users with a machine and human readable decentralized name for login and SSI.
- **Payment integration:** A Photochromic ID automatically resolves to major Ethereum-based wallet providers^[3].
- **Identity verification:** A Photochromic ID authenticates identity, proof of liveness and similarity check to government-issued identity is required^[4].
- **SBT generative art:** A Photochromic ID is provided with a unique digital representation of their identity using algorithmic art that is created during the SBT minting process. To maximize decentralization and user control, the SBT artwork is stored decentrally on IPFS.
- **Social media:** With a Photochromic ID, the user can opt to link and verify certain social media handles.

Figure 2: Building blocks of Photochromic



Protocol Revenue

Photochromic forecasts generating an income as follows:

- **Mint Fee:** To mint a Photochromic ID, users pay a once-off purchase fee.
- **Extension Fee:** Photochromic identities are valid for a fixed period and are renewable to ensure that the IDV remains valid.
- **Transaction Fee:** To verify identity, a verification fee is applicable per transaction.

Use Cases

Photochromic's use cases cover the full spectrum of digital transactions, affecting and influencing various areas of Web3:

Crypto exchanges

- A Photochromic ID reduces the identity fraud in new listings at crypto exchanges, providing a security mechanism to verify the identity of the employees of crypto exchanges.
- In keeping with the European Union regulations relating to the transfer of crypto assets (“**EU Travel Rules**”), the Photochromic ID can attest the identity of the user for all crypto asset transactions.
- To reduce the cost, time and resources dedicated to the identity verification (“**IDV**”) process.

GameFi

- A Photochromic ID leverages the same identity in different games and across different chains.
- A Photochromic ID fast tracks the authentication of achievement levels, player status and entrance into online events.

Gated Communities

- A Photochromic ID reduces the likelihood of scammers, bots, and impersonators from being accepted into gated communities.
- A Photochromic ID reduces the time required to join allowlists and improves the user experience.

Traditional Financial Institutions

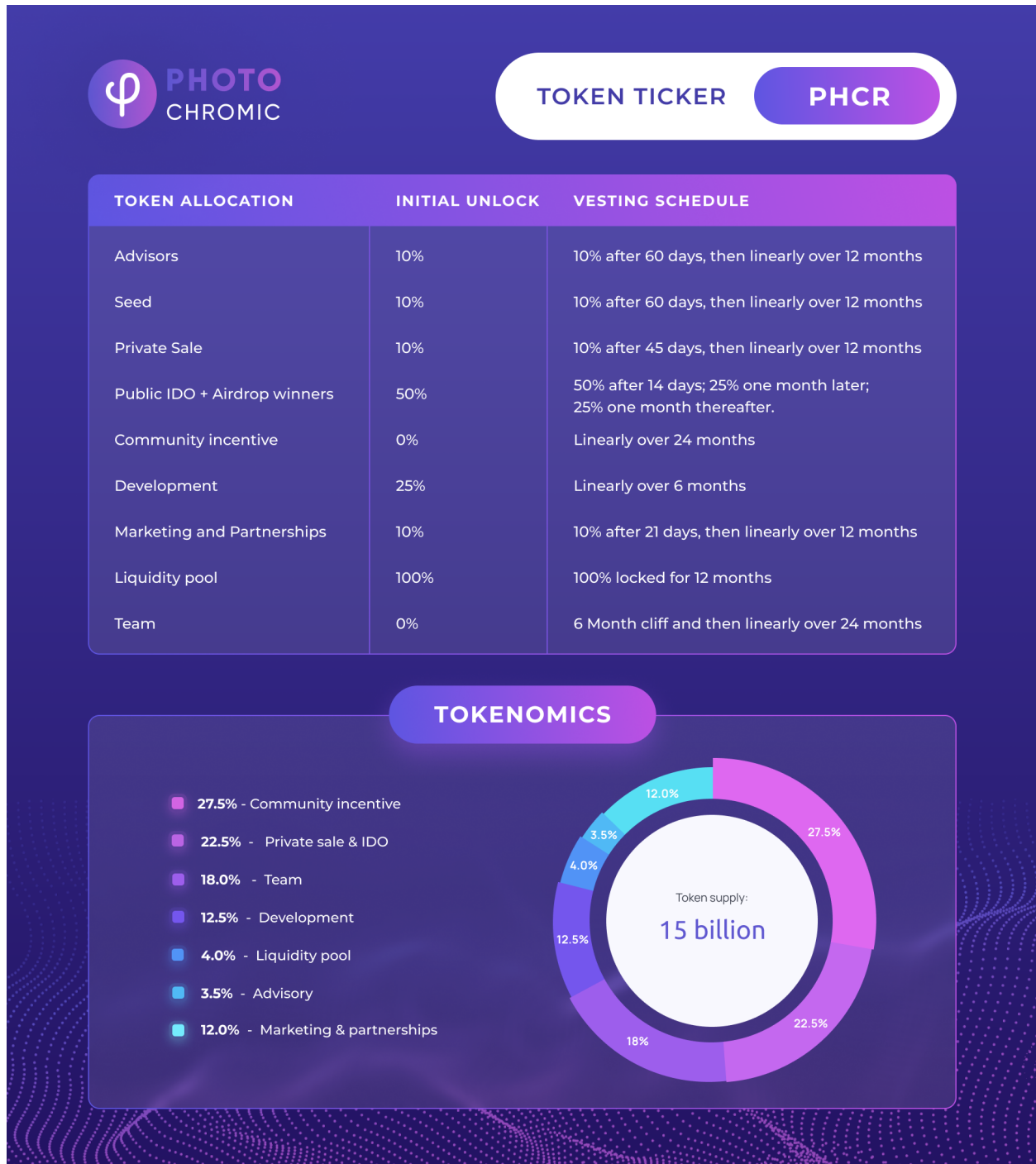
- A Photochromic ID broadens and deepens the existing relationships with customers and facilitates their discovery of crypto through an intermediary that they trust, minimizing the potential for identity fraud.
- A SBT facilitates attracting the next wave of wealth creators.

Customer

- A SBT reduces, reuses, and recycles the IDV processes undertaken with trusted third parties in the ecosystem, reducing the time required to be allowlisted or the like.
- A SBT minimizes the data shared between counterparties and reduces the likelihood of identity fraud.
- For content creators, a SBT anchors ownership and facilitates identity management in a central location within the control of the user.
- A SBT verifies true ownership of avatars, NFTs, Twitter, Google, and Discord handles in a decentralized way.
- A SBT creates a decentralized address book to send and receive crypto using social handles.

Tokenomics

\$PHCR will be distributed in Photochromic’s upcoming Initial Decentralized Exchange Offering (“IDO”).

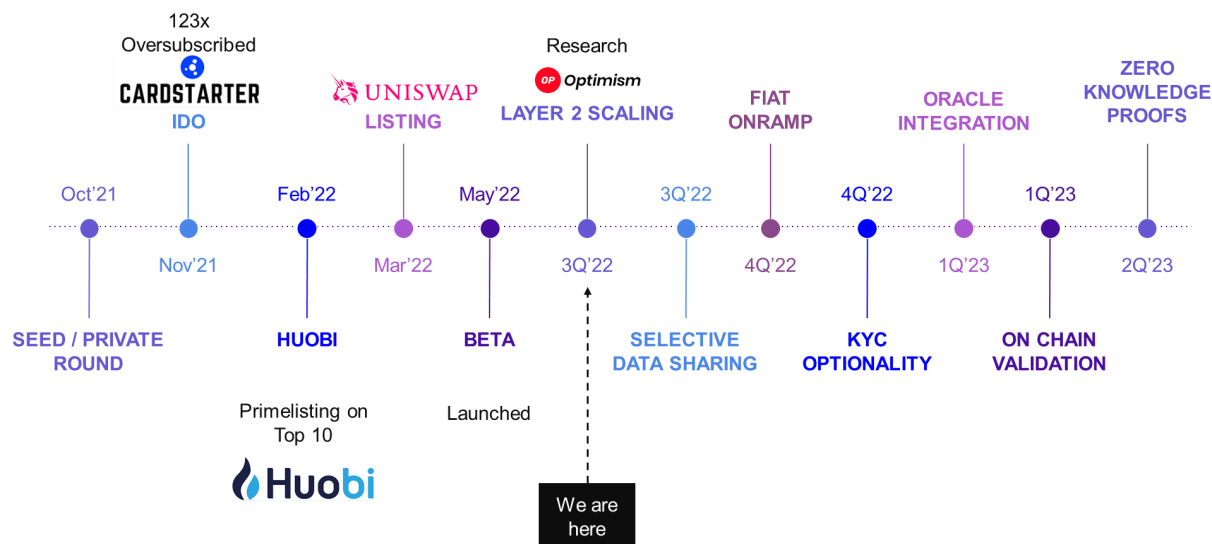


The Roadmap

Our journey to date

Here is an overview of our journey to date and the milestones ahead. We work to achieve our desired level of on-chain validation, security, and programmable privacy.

Figure 16: Photochromic roadmap



Development plans for 2022 / 2023

Our core development objectives for 2022 / 2023 will expand on the Beta product release, extending the utility provided to Photochromic ID holders:

- Layer 2 scaling:** While embracing a multi-chain future, secured tamper-proof identities deserve the security of Ethereum. Given the popularity of Ethereum and the total value it secures, Ethereum Layer 1 transaction fees are high. A Layer 2 solution combines the security of Ethereum at a fraction of the cost, thereby making Photochromic more accessible to all. Photochromic can be used on any other Layer 1 chain (Solana, Polkadot, Cardano), sidechains (Polygon) or other Ethereum Layer 2 platforms (Arbitrum and Optimism). For these integrations, Photochromic follows the roadmap of ENS including standardization efforts on off-chain data retrieval and validation (EIP-3668).
- Selective data sharing:** In keeping with the functionality and extensibility of ENS in the beta release, Photochromic leverages the functionality of the SIWE project. This

facilitates easy and convenient user-centric access to multiple Web-based services and enables users to selectively share bespoke, customized components of their identity without compromising their privacy^[3]. Selective data sharing empowers the user to self-select the public and private attributes of their identity, with the public attributes being easily searchable via their wallet, thereby creating a readable and searchable history of transactions^[1]. In this way, the public attributes of digital identity can be showcased in bespoke contexts to select audiences^[1].

- **Decentralizing identity verification providers:** Photochromic intends to onboard additional identity verification providers, providing greater optionality and flexibility for users when initially verifying their identity in the SBT minting process. Photochromic will propose specification and onboarding processes for identity solutions which will be selected and prioritized in the Photochromic DAO.
- **EU Travel Rules compliance:** The current IDV functionality will be extended to include Know-your-Business processes. This is in keeping with the EU “Travel Rules” that require certain personally identifiable information to be shared between the transferring and receiving crypto exchange for all crypto asset transfers.
- **Fiat onramp:** To eliminate potential user drop-off resulting from the user not having a pre-existing wallet, a fiat onramp will be provided. This is also a super integration for, and natural extension of, the services currently provided by Web2 banks and payment card service providers such as Visa, Amex and Mastercard.
- **Oracle integration:** To verify social media handles and incorporate real world data into the Photochromic protocol, integration with Oracles is required. The Oracle integration enables Photochromic to verify Twitter, Gmail, and Discord handles in a decentralized way.
- **On-chain validation:** To comply with the requirements of the EU Travel Rules, on-chain validation is required. For example: performing a liveness check, prior to enabling a client to exchange a crypto asset on a decentralized exchange.
- **Zero Knowledge Proofs (“ZKP”):** A ZKP is a cryptographic method that enables one party to prove to another party that a given statement is true, without sharing any additional information, apart from the fact that the statement is indeed true. For example: Bob wants to prove to Jack that he is older than 18 years. Bob’s claim can be verified using a ZKP and the personal data shared is minimized. Bob does not give Jack

his driver's license or even selectively share bespoke information from his driver's license such as his driver's license number. ZKP is the holy grail of data-sharing, as data is simply not shared between the parties, minimizing the probability of identity fraud.

The PhotoSapiens

The products of Photochromic are called Photosapiens. As a PhotoSapien, a portable, verifiable digital identity can be used in the Metaverse, without having to expose personally identifiable information. There are two collections of PhotoSapiens, namely the Genesis and Soulbound Editions.

Genesis Edition

The Genesis Edition is the first collection of PhotoSapien that is used to establish the Decentralized Autonomous Organization (“**DAO**”). When the biometric PhotoSapien SBT (“**Soulbound Edition**”) deploys, the DAO will guide the design. This collection of 10,000 Genesis PhotoSapiens guides the future of Photochromic.

Soulbound Edition

The Soulbound^[2] Collection of the PhotoSapiens includes an IDV process that can be used to authenticate, verify, and attest identity in the Metaverse. As it is generated by the user's unique biometrics, and it is therefore non-transferable. As part of the Soulbound Collection, the user will be able to create their own ENS subdomain and will be directed to an approved identity verification partner for identity verification purposes.

The table hereunder illustrates how the Genesis Collection differs from the Soulbound Collection:

	Genesis	Soulbound
Ability to transfer your NFT	✓	
Photochromic DAO participation	✓	
Priority access	✓	
Generative art	✓	✓
Link to an ENS subdomain		✓
Resolves a wallet	✓	✓
Verify an identity		✓
Link to an existing avatar		✓

Parting Words

Should you have any comments or suggestions on this Whitepaper, please share them with us.

References

- [1] K. Cameron, “The Laws of Identity”, <https://www.identityblog.com/?p=352>, May 2005.
- [2] E. Weyl, P. Ohlhaber, V. Buterin, “Decentralized Society: Finding Web3’s Soul”, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4105763, May 2022.
- [3] Finextra Research, “The Future of Digital Identity 2022: Inclusive, Secure, Fit for Purpose”, <https://www.finextra.com/the-long-read/421/the-future-of-digital-identity-separating-the-digital-from-the-individual>, 2022.
- [4] Oliver Wyman, IBFED, “Digital Trust: How banks can secure our digital identity”, <https://www.oliverwyman.com/our-expertise/insights/2021/dec/how-banks-can-secure-our-digital-identity-ibfed.html>, December 2021.