Decentralized IDentifiers (DIDs)

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sovrin

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Intro: Self-Sovereign Identity

- Emerging paradigm: **“Self-Sovereign Identity”**

“The central problem of the future is, how do we return control of our identities to the people themselves?”
- Edward Snowden

PERKINSCOIE
COUNSEL TO GREAT COMPANIES

“DLT is generally well-suited to serve as the underlying technology for SSI because it offers a way to create a single source of identity that can be trusted by everyone, that is completely portable, but that no one entity owns or controls.”

UBS

“...we think self-sovereign [identity] solutions are likely to be the standard against which other platforms will need to be held.”

Craig Newmark
Founder, CraigsList

“I’d like to use [blockchain] for verifiable identity.”

- Combine digital human rights with industrial use of personal data.

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Decentralized IDentifiers (DIDs)

- Developed at Rebooting-the-Web-of-Trust workshop and W3C Credentials CG
- Persistent, dereference-able, cryptographically verifiable identifiers
- Registered in a blockchain or other decentralized network
- **`did:sov:3k9dg356wdcj5gf2k9bw8kfg7a`**
- Modular specification using “methods”:
- **`did:sov`**, **`did:btcr`**, **`did:v1`**, **`did:uport`**, …
- Can be pairwise unique for each relationship
- Resolution: DID → DID Document
  - Set of public keys
  - Set of service endpoints

Method	DID Prefix
Sovrin	did:sov:
Bitcoin	did:btcr:
uPort	did:uport:
VeresOne	did:v1:
IPFS	did:ipid:
IPDB	did:ipdb:
Blockstack	did:stack

Decentralized IDentifiers (DIDs)

- Example DID Document:


```
{
  "@context": "https://w3id.org/did/v1"
  "id": "did:btcr:xkrn-xzcr-qqlv-j6sl",
  "service": [
    {
      "type": "agent",
      "serviceEndpoint": "https://azure.microsoft.com/dif/hub/did:btcr:xkrn-xzcr-qqlv-j6sl"
    },
    {
      "type": "xdi",
      "serviceEndpoint": "https://xdi03-at.danubeclouds.com/cl/+!:did:btcr:xkrn-xzcr-qqlv-j6sl"
    }
  ],
  "authentication": {
    "type": "EdDsaSASignatureAuthentication2018",
    "publicKey": [
      "did:btcr:xkrn-xzcr-qqlv-j6sl#key-1"
    ]
  },
  "publicKey": [
    {
      "id": "did:btcr:xkrn-xzcr-qqlv-j6sl",
      "type": "Secp256k1VerificationKey2018",
      "publicKeyHex": "024a63c4362772b0fafc51ac02470dae3f8da8a05d90bae9e1ef3f5243180120dd"
    }
  ]
}
```

Decentralized IDentifiers (DIDs)

- Decentralized Identity Foundation:
  - https://identity.foundation/
- Universal Resolver / Universal Registrar
  - https://uniresolver.io/
- DPKI: Decentralized Public Key Infrastructure
- DKMS: Decentralized Key Management System
- Verifiable Credentials: Cryptographically verifiable statements
- DID Auth: Authentication, Single-Sign-On
- DID Names (BNS, ENS, ...), e.g. **markus.id**

Thank You

- https://danubetech.com/
- markus@danubetech.com

Intro: Self-Sovereign Identity

- **Definition:**

  “Lifetime portable identity for any person, organization, or thing that does not depend on any centralized authority and can never be taken away.”

- **Properties:**
- Control
- Consent
- Contextual
- No central authority
- No intermediaries
- Minimal disclosure
- Choice of persistence
- Portable
- Inter-operable
- Technology pluralistic

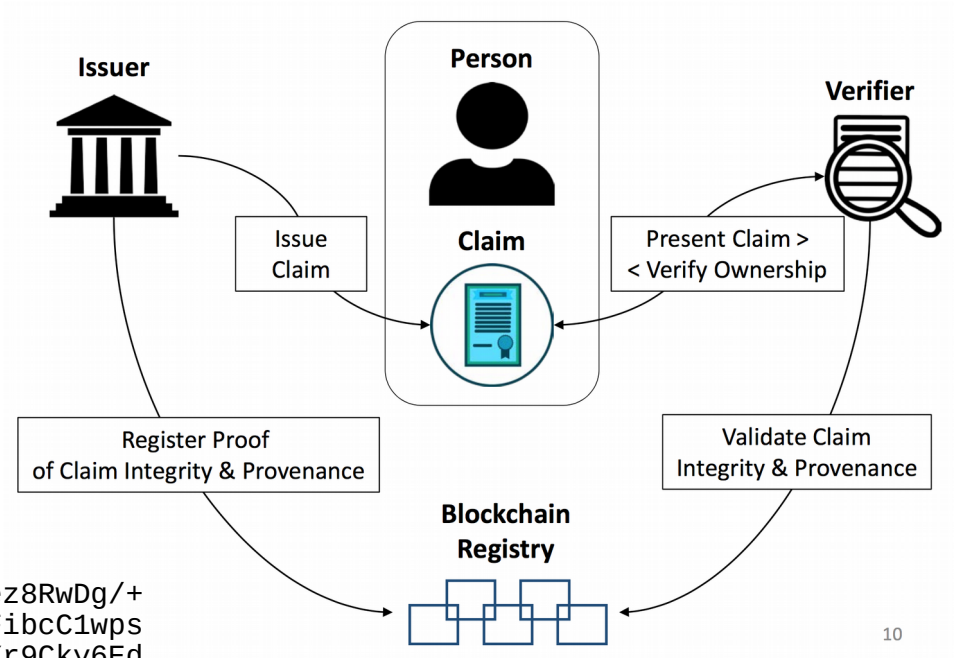
Verifiable Credentials

- Verifiable Claims W3C WG (includes Linked Data Signatures)
- Credentials W3C CG and Digital Verification W3C CG
- Semantic data that is “attested” instead of “self-asserted”
- Cryptographically verifiable statements of an entity (“Issuer”, “Claimant”) about another entity (“Subject”, “Holder”), e.g.:
  - Post office says: “Ms. Voshmgir has an address in Berlin.”
  - University says: “Mr. Sabadello has a computer science degree.”
  - Training Institution says: “Mr. Fölser is a certified aircraft technician.”
- Based on RDF data model and JSON-LD format, using DIDs or other URIs.
- Basis for “trust” and “reputation” in combination with a trust framework.

Verifiable Credentials

- Example:

```
{
  "@context": "https://w3id.org/security/v1",
  "id": "http://example.gov/credentials/3732",
  "type": ["Credential", "ProofOfAgeCredential"],
  "issuer": "https://dmv.example.gov",
  "issued": "2017-01-01",
  "claim": {
    "id": "did:sov:ebfeb1f712ebc6f1c276e12ec21",
    "ageOver": 21
  },
  "signature": {
    "type": "LinkedDataSignature2015",
    "created": "2016-06-18T21:19:10Z",
    "creator": "https://example.com/jdoe/keys/1",
    "domain": "json-ld.org",
    "nonce": "598c63d6",
    "signatureValue": "BavEll0/I1zpYw8XNi1bgVg/sCneO4Jugez8RwDg/+
    MCRVpjOboDoe4SxxKjkCOvKiCHGDvc4krqi6Z1n0UfqzxGfmatCuFibcC1wps
    PRdW+gGsutPTLzvueMWmFhwYmfIFpbBu95t501+rSLHIEuujM/+PXr9Cky6Ed
    +W3JT24="
  }
}
```



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Intro: Digital Identity

- Kim Cameron (Microsoft): The Laws of Identity (2006)
  - "The Internet was built without an Identity layer"
- Evolution:
  - Username+Password
  - Centralized: MS Passport/365, Login with Facebook, Google, Twitter
  - Enterprise/Government Identity Federation: SAML
  - User-Centric Identity: Eclipse Higgins, OpenID, Cardspace, OAuth, UMA
  - Federated Social Web: Diaspora, OStatus, IndieWeb
  - Personal Data Stores: Personal.com, MyDex, Azigo
  - Personal Clouds/PIMS: Meeco, CozyCloud, Digi.Me, Respect Network
  - Decentralization: Unhosted, Webfinger, WebID/Solid, XDI, FreedomBox
  - First-Party Terms, Consent Receipts, Link Contracts, DNT
  - Blockchain Identity: Namecoin, Blockstack, uPort, Sovrin, Jolocom, DIDs

"On the Internet, nobody knows you're a dog."

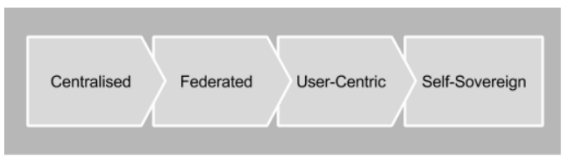

Fig 1. The evolution of online identity

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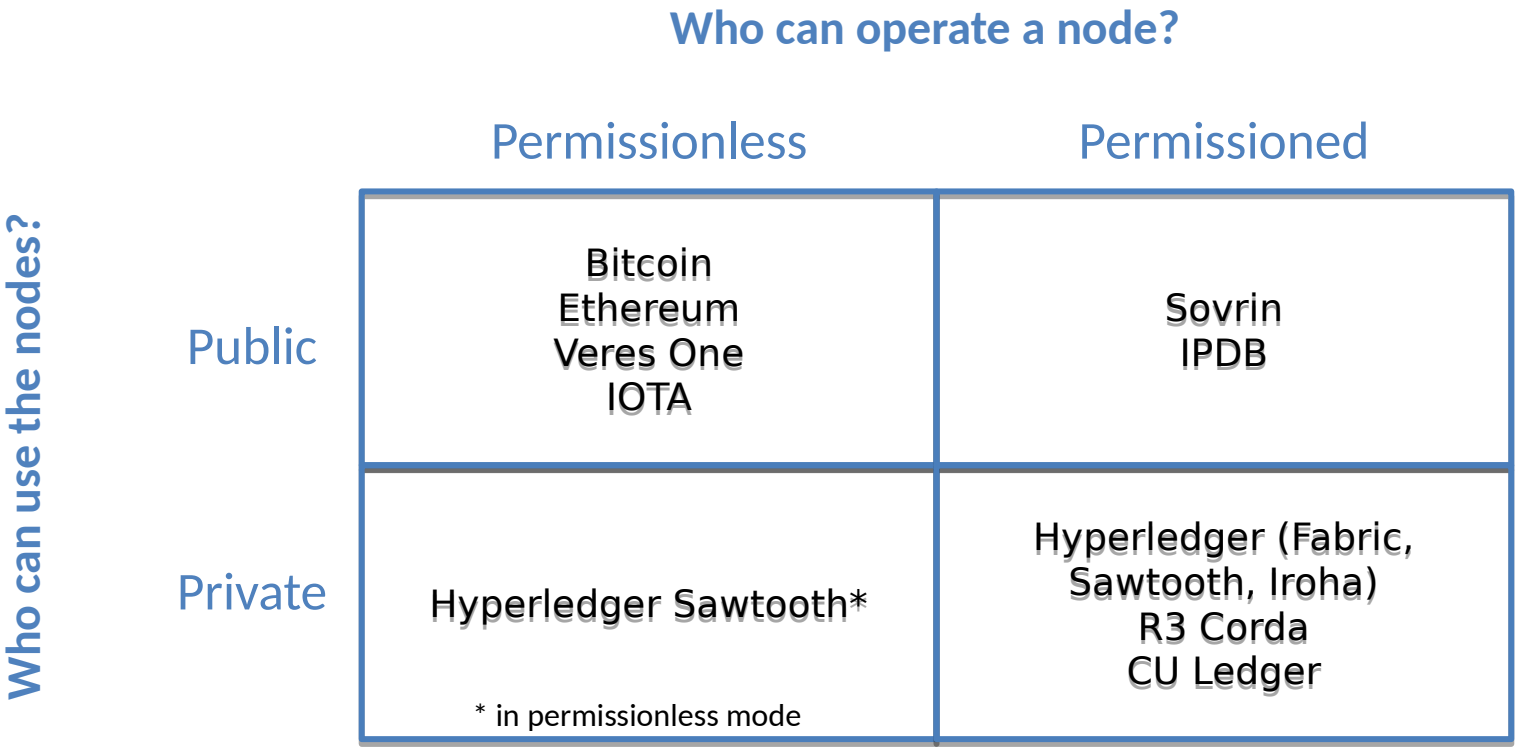
Blockchain Characteristics



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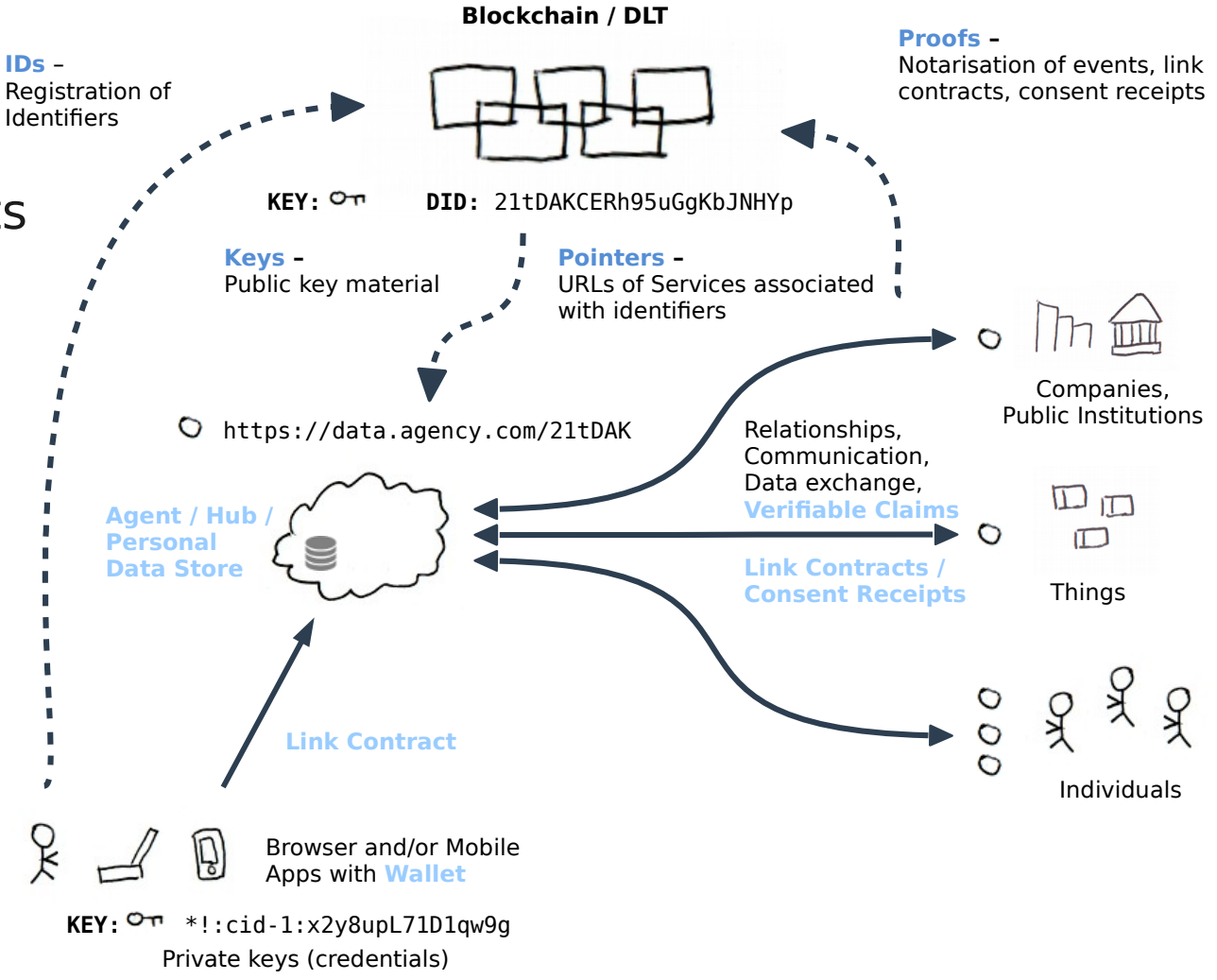
Sovrin / Indy

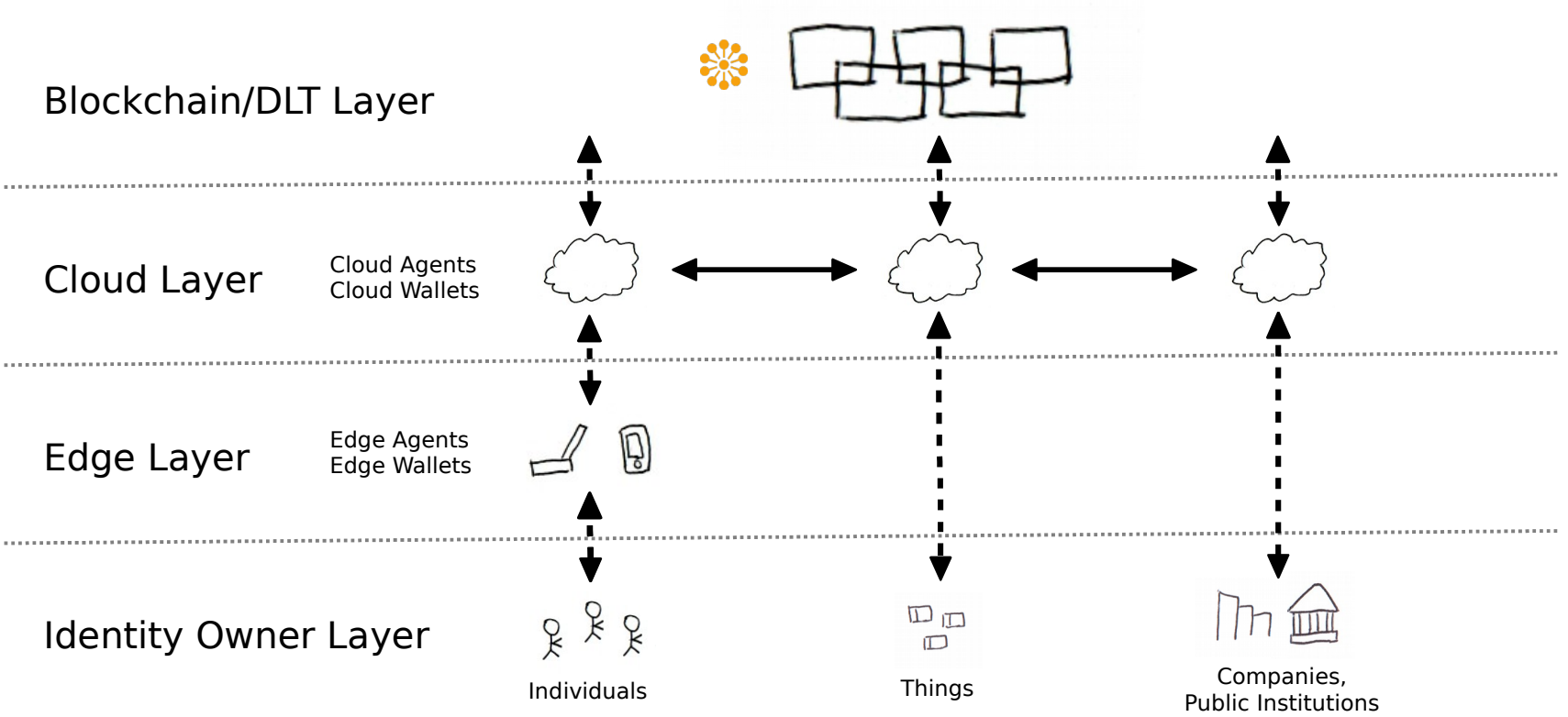
- https://sovrin.org/
- Sovrin Foundation –
  Board of Trustees, Stewards, Technical Governance Board
- “Indy” = Open-source project at Hyperledger
- “Sovrin” = Public, permissioned deployment of Indy nodes
- Registration of DIDs and DID Documents
- Sovrin Trust Framework
- 24 Stewards in 12 countries
- Indy Nodes, Agents & Clients

Architecture

- Example Components
- “On-chain” vs. “Off-chain”



Ledger/Agent Architecture



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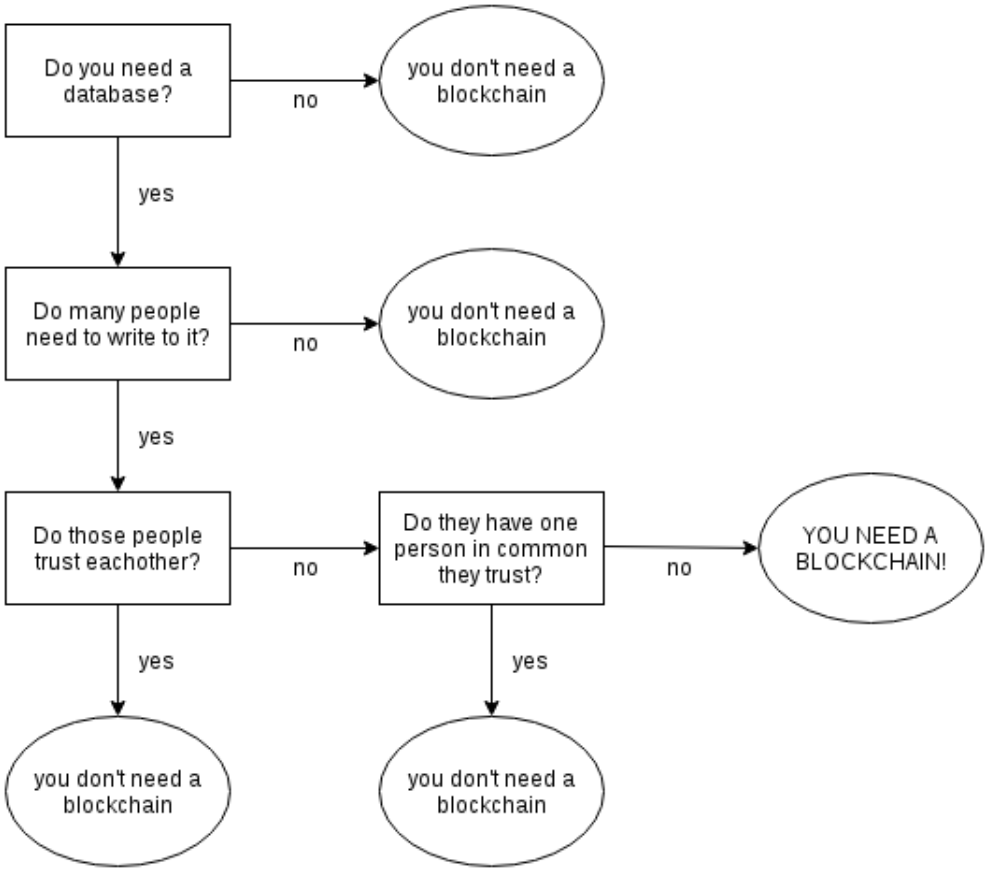
Danube Tech GmbH

- https://danubetech.com/
- Founded 2015 in Vienna
- Working on core Sovrin and XDI infrastructure
- Strong international network
- “Founding Steward” at Sovrin Provisional Network
- “Founding Member” at Decentralized Identity Foundation
- “Founding Partner” at Respect Network
- Member of Personal Data Ecosystem Consortium
- Best of 10 at SBA “Security Rockstars” Competition
- Best of 15 at “Austria’s Next Top Start Up 2016”
- Selected for “Pioneers500” in 2016 und 2017
- Selected for “Netidee” (ISPA) Förderaktion in 2017

XDI

- “eXtensible Data Interchange”
- Protocol for data sharing and messaging
- Specifically designed for decentralized digital identity
- Vision: Global graph of personal and organizational data.
- Extension of the RDF graph model.
- Built-in support for “verifiable claims”, “connection requests”, “connection offers”, “link contracts”, “consent receipts”.
- Concept of “connectors” (aka “gateways”, “plugins”)
- Developed at OASIS XDI Technical Committee.
- 3rd generation, previously XRI/XDI.

Do you need a blockchain?



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