Tracy Kuhrt
Community Architect, Hyperledger

20+ years of software engineering and architecture experience

The Linux Foundation
PayPal
Microchip Technologies

Twitter: @TracyKuhrt
Hyperledger Chat: tkuhrt
Agenda

1. The Linux Foundation and Hyperledger
2. Decentralized Identity Concepts
3. Demo Use Case
4. Hyperledger Indy and How to Get Involved
The Linux Foundation is Much More than Linux

Security
We are helping global privacy and security through a program to encrypt the entire internet.

Networking
We are creating ecosystems around networking to improve agility in the evolving software-defined datacenter.

Cloud
We are creating a portability layer for the cloud, driving de facto standards and developing the orchestration layer for all clouds.

Automotive
We are creating the platform for infotainment in the auto industry that can be expanded into instrument clusters and telematics systems.

Blockchain
We are creating a permanent, secure distributed ledger that makes it easier to create cost-efficient, decentralized business networks.

Web
We are providing the application development framework for next generation web, mobile, serverless, and IoT applications.

We are regularly adding projects; for the most up-to-date listing of all projects visit tlfprojects.org
Hyperledger

Open source collaborative effort to advance cross-industry blockchain technologies

Hosted by The Linux Foundation, fastest-growing project in its history

Global collaboration spanning finance, banking, IoT, supply chains, manufacturing and technology
Community Stewardship and Technical, Legal, Marketing, Organizational Infrastructure

Frameworks

- **HYPERLEDGER BURROW**: Permissionable smart contract machine (EVM)
- **HYPERLEDGER FABRIC**: Permissioned with channel support
- **HYPERLEDGER INDY**: Decentralized identity
- **HYPERLEDGER IROHA**: Mobile application focus
- **HYPERLEDGER SAWTOOTH**: Permissioned & permissionless support; EVM transaction family

Tools

- **HYPERLEDGER CALIPER**: Blockchain framework benchmark platform
- **HYPERLEDGER CELLO**: As-a-service deployment
- **HYPERLEDGER COMPOSER**: Model and build blockchain networks
- **HYPERLEDGER EXPLORER**: View and explore data on the blockchain
- **HYPERLEDGER QUILT**: Ledger interoperability
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Identity Models
Third Party IDP (Federated Identity)

Standards:
- SAML
- OAuth
- OpenID Connect

CC BY-SA 4.0 - From The Story of SSI Open Standards by Drummond Reed, Chief Trust Officer Evernym and Sovrin Foundation Trustee
Self Sovereign Identity (SSI)

You <-> Peer

Connection

Distributed Ledger (Blockchain)

CC BY-SA 4.0 - From The Story of SSI Open Standards by Drummond Reed, Chief Trust Officer Evernym and Sovrin Foundation Trustee
Decentralized Identifiers
URN Syntax (RFC 2141)

```
urn:uuid:ae84-d5c2-9fb785ea-72cd34
```

- **Scheme**
- **Namespace**
- **Namespace-specific Identifier**
DID Syntax

```
did:sov:3k9dg356wdcj5gf2k9bw8kfg7a
```

- **Scheme**:sov
- **Method**:3k9dg356wdcj5gf2k9bw8kfg7a
- **Method-specific Identifier**:3k9dg356wdcj5gf2k9bw8kfg7a
You will not just have one DID

Individuals will have hundreds or thousands of DIDs to prevent correlation -- each one is a pairwise-unique pseudonym
Zero-Knowledge Proofs
A zero-knowledge protocol is a method by which one party (the prover) can prove to another party (the verifier) that something is true, without revealing any information apart from the fact that this specific statement is true.

- The Knowledge Complexity of Interactive Proof Systems
  Shafi Goldwasser, Silvio Micali and Charles Rackoff
Proving Your Age

Name: John Doe
Address: 123 Never St
Phoenix, AZ 85001
Birth Date: 01/01/1995

Without
Zero Knowledge
Proofs

With
Zero Knowledge
Proofs

Over 21 ✔️
Verifiable Credentials
Today's Credential Workflow

1. Issue credential
2. Present credential
3. Validate credential integrity
Verifiable Credential Workflow

1. Register proof of credential integrity and provenance
2. Issue credential
3. Present credential
4. Validate credential integrity and provenance

CC BY-NC-SA 4.0 - Adapted from *Blockchain Security and Privacy* by Anil John, Digital Security Coach
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Permitify Demo - Starting a Restaurant Recipe

BC Registries Business Incorporation

BC Provincial Sales Tax Number

Worksafe BC Clearance Letter

Fraser Valley Health Operating Permit

BC Liquor License

City of Surrey Business License

https://devex-von-test.pathfinder.gov.bc.ca/en/recipe/start_a_restaurant
Registering a Restaurant in British Columbia

1. BC Registries Business Incorporation
   - BC Provincial Sales Tax Number
   - Worksafe BC Clearance Letter
     - Fraser Valley Health Operating Permit
2. BC Liquor License
3. City of Surrey Business License
BC Registries and Online Services administers and supports the legal framework used for operating a business, not-for-profit society, cooperative association or financial institution in B.C. Organizations need to register, file documents and update records, which are kept as a matter of public record.

Use the form below to register a BC corporation.

Incorporation

* Legal Name (required)
  Tracy's Demo Restaurant

* Mailing Address (required)
  Attention
  Street Address
  1 Léandre St
  City
  Memramcook
  Postal Code
  E4K 0B8

  Province
  New Brunswick
  Country
  Canada

Submit
Tracy's Demo Restaurant

BC Corporate Registry

Issuer: BC Corporate Registry
Issuer Website: https://bc-registries-devex-von-permitify-dev.pathfinder.gov.bc.ca
Effective Date: 2018-05-22
Expiry Date: -

Verification Status: success

{
"success": true,
"proof": {
  "proof": {
    "proof": {
      "proofs": {
        "claim::e0df543-252e-47aa-a338-b112440c0379": {
        "primary_proof": {
          "eq_proof": {
            "revealed_attrs": {
              "address_line_1": "82262648855762531512959697729136391481549508910336778152654644",
              "address_line_2": "4294967296",
            
```
Tracy's Demo Restaurant

Organization Identifier
d901904c-b53c-46e5-80cd-1c103501c179d

Organization Type
CO

Location
1 Léandre St
Memramcook, NB E4K 0B8
Canada

BC Registries Business Incorporation

Issuer
BC Corporate Registry

Effective Date
2018-05-22

Expiry Date
-

BC Provincial Sales Tax Number

Certificate not found

 Depends on
   BC Registries Business Incorporation

[View record]

Worksafe BC Clearance Letter

Certificate not found

 Depends on
   BC Registries Business Incorporation

[View enrollment for a Clearance Letter with WorkSafe BC]
Fraser Valley Health Operating Permit

Certificate not found

Depends on
- ✔ BC Registries Business Incorporation
- ✗ Worksafe BC Clearance Letter

Enrolment with the Fraser Valley Health Authority
BC Liquor License

Certificate not found

Depends on
- BC Registries Business Incorporation
- BC Provincial Sales Tax Number
- Worksafe BC Clearance Letter
- Fraser Valley Health Operating Permit

Enrolment with the BC Liquor Control and Licensing Branch

City of Surrey Business License

Certificate not found

Depends on
- BC Registries Business Incorporation
- BC Provincial Sales Tax Number
- Worksafe BC Clearance Letter
- Fraser Valley Health Operating Permit
- BC Liquor License

Enrolment for your Business Licence with the City of Surrey
Cryptographically verified:

true

Available claim data:

```
{
    "address_line_2": "",
    "worksafe_letter_exists": "5d103af8-8107-49cc-b0a1-fb7aa3a46ad8",
    "legal_entity_id": "5d103af8-8107-49cc-b0a1-fb7aa3a46ad8",
    "org_type": "CO",
    "country": "CA",
    "end_date": "",
    "city": "Calgary",
    "addressee": "Tracy",
    "effective_date": "1527614361",
    "address_line_1": "325-3223 83 St NW",
    "legal_name": "Tracy's Food",
    "postal_code": "T3B 5N8",
    "province": "AB",
    "corp_num": "5d103af8-8107-49cc-b0a1-fb7aa3a46ad8"
}
```
Barnes Corp.

Organization Identifier
851e14cb-c09c-442b-977f-1dcbe6356507

Organization Type
CO

Locations
Mr. Barnes
1234 SomeWhere St.
Victoria, BC V8V8V8
Canada
Show on map

Permits and Licences

<table>
<thead>
<tr>
<th>Permit Type</th>
<th>Date</th>
<th>Related to</th>
</tr>
</thead>
<tbody>
<tr>
<td>WorkSafe BC</td>
<td>2018-05-11</td>
<td>And 1 related</td>
</tr>
<tr>
<td>BC Corporate Registry</td>
<td>2018-05-02</td>
<td></td>
</tr>
<tr>
<td>BC Ministry of Finance</td>
<td>2018-05-02</td>
<td></td>
</tr>
<tr>
<td>Fraser Valley Health Authority</td>
<td>2018-05-02</td>
<td></td>
</tr>
<tr>
<td>Liquor Control and Licensing Branch</td>
<td>2018-05-02</td>
<td></td>
</tr>
<tr>
<td>City of Surrey</td>
<td>2018-05-02</td>
<td></td>
</tr>
</tbody>
</table>
Enabling safe, secure digital interactions to make a better Internet for getting business done.

Verifiable Organizations Network (VON) from the Government of British Columbia

https://von.pathfinder.gov.bc.ca/
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Tools, libraries, and reusable components for providing digital identities rooted on blockchains or other distributed ledgers so that they are interoperable across administrative domains, applications, and any other silo.
Hyperledger Indy's Open Source Stack

Identity Solutions
Agent
SDK
Node
Plenum
Crypto
## Hyperledger Indy Roadmap

<table>
<thead>
<tr>
<th>Indy Node</th>
<th>Indy SDK</th>
<th>Agents</th>
<th>Crypto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network monitoring</td>
<td>Pluggable storage</td>
<td>Default / Reference Agent</td>
<td>Anoncreds Schema Enhancements</td>
</tr>
<tr>
<td>DID / DID Doc and Credentials standards compliance</td>
<td>New encryption format</td>
<td>Agent Discovery Protocol</td>
<td>Hyperledger Shared Crypto Library</td>
</tr>
<tr>
<td>Agent-to-agent communication instead of ZMQ</td>
<td>Pluggable payment interface</td>
<td>Agent messaging standardization</td>
<td>Protocol compatibility with Identity Mixer</td>
</tr>
<tr>
<td>Node Reputation</td>
<td>Thread Safety and parallelism</td>
<td>Protocol test suite</td>
<td>Set Membership attributes</td>
</tr>
<tr>
<td>Sharding</td>
<td>Android support</td>
<td>Message families</td>
<td>More ZK tools</td>
</tr>
</tbody>
</table>
Collaboration Tools

**Account**
Sign up for a Linux Foundation account

**Chat**
Join the discussion on chat

**Mailing Lists**
Participate on the Hyperledger Mailing Lists

**Github**
Check out our code repositories

**Wiki**
Get the latest development updates from the wiki

**Bug Reporting**
Search for open bugs, or report a new one, in our bug database
Contribute to Coding

CONTRIBUTING guides
Get a copy of the repository
Find an issue to work on
Make your changes

Create a pull request
Expect comments
Address comments
Project Enhancement

RFC process for documenting and proposing changes to the project

https://github.com/hyperledger/indy-hipe
Communication Channels

Chat:
https://chat.hyperledger.org/channel/indy

Mailing List:
https://lists.hyperledger.org/g/indy
Working Group Call
Development and architecture discussions
Thursday 8 AM PT, 11 AM ET, 5 PM CET
https://zoom.us/j/hyperledger-community
Wiki

Pointers to documentation, source code, and other useful information about Hyperledger Indy

https://wiki.hyperledger.org/projects/indy
Questions?

Tracy Kuhrt, Community Architect, Hyperledger
twitter.com/tracykuhrt
@tkuhrt on Hyperledger Chat