



NEO of THINGS

The 1st Practical IoT Distributed Ledger Solution

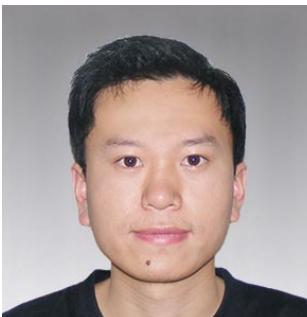
norchain.io

Content

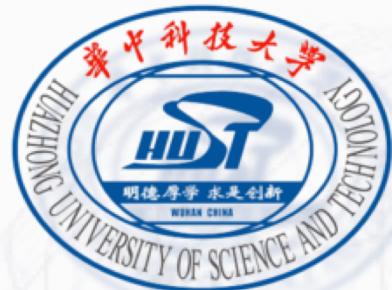
- Team: norchain.io
- Practical IoT Solution: NEOT: PROV + NEO
- Ongoing Cooperation

about norchain.io

norchain.io - members



norchain.io - Education



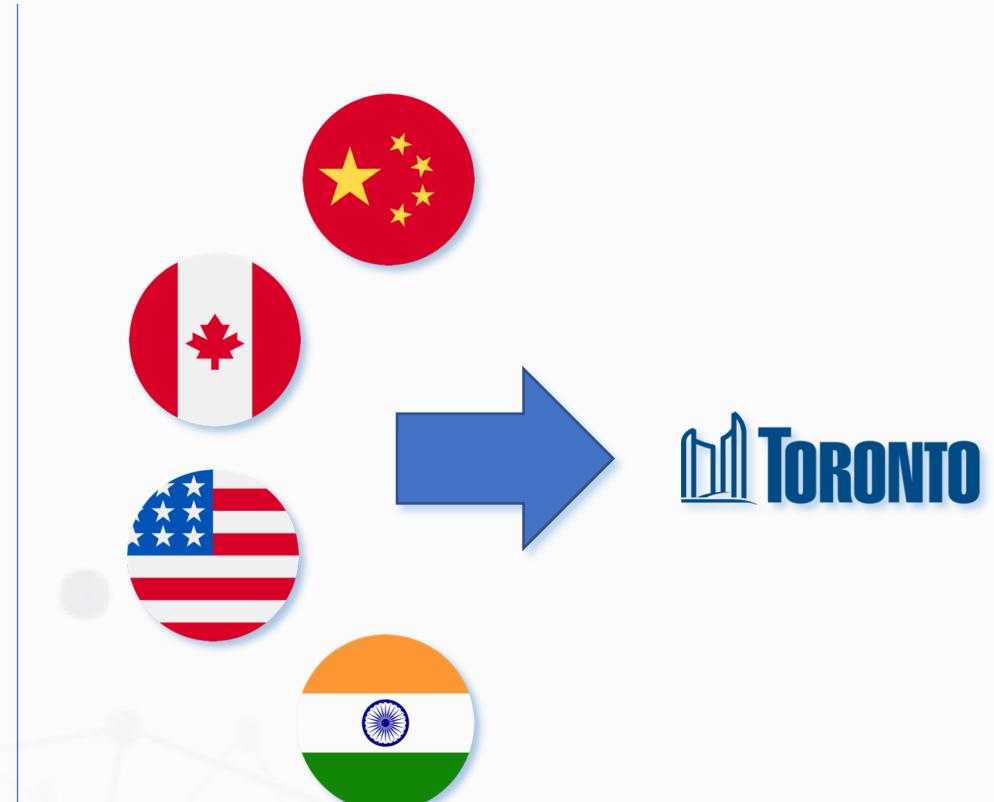
norchain.io - Expertise

- Blockchain Experts
- Software Engineers
- IoT Expert
- Mng. & Marketing Guru
- Big Data Scientists
- Security Expert



norchain.io - Diversity

- International team: ideas from varied backgrounds.
- @Toronto, high-tech center of blockchain and AI. Passionate projects and funds.
- @Canada, positive and stable policies to blockchain and cryptocurrency, more open than US and China.
- Ongoing industrial relationships regarding to blockchain projects in both China and Canada.



NEOT: PROV + NEO

The 1st Practical IoT Distributed Ledger Solution

IoT: The Challenges



Security



Privacy



Compatibility

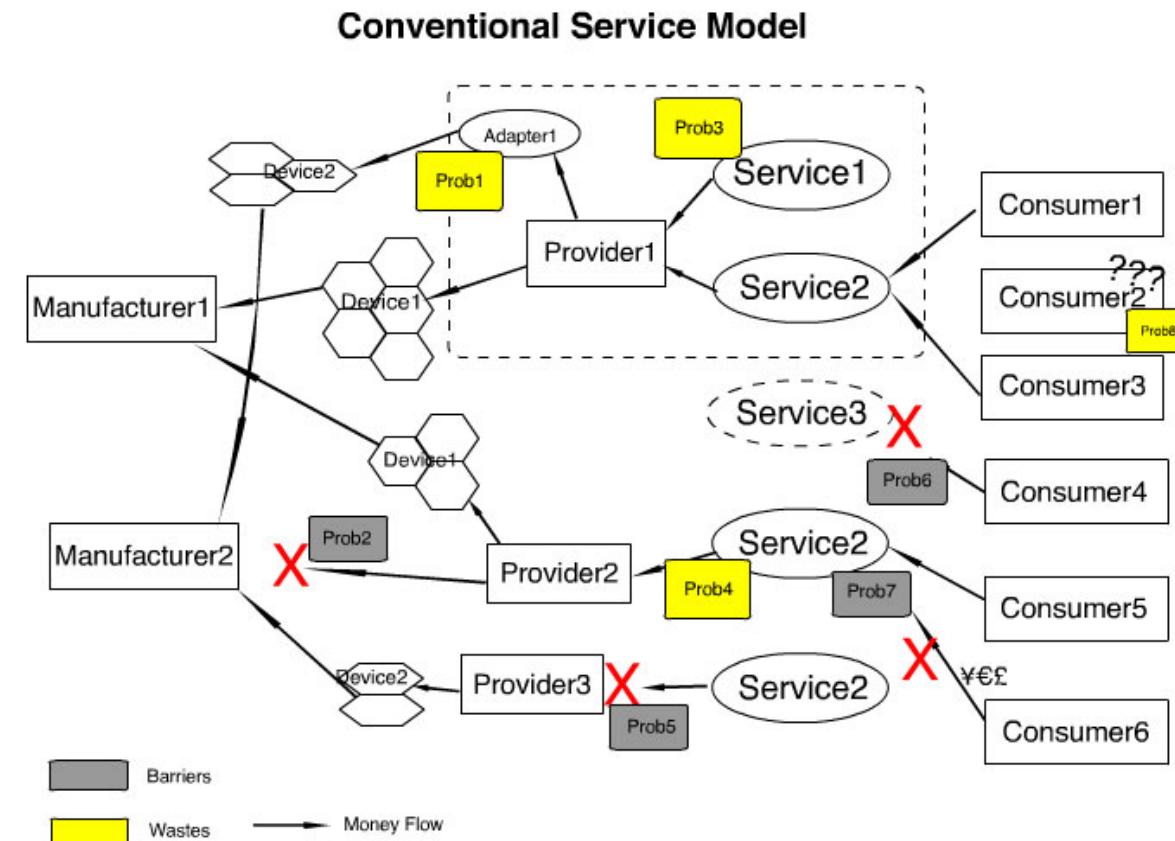


Connectivity

IoT: The Challenges

Conventional Service Model

- Redundant works and barriers in many places. Waste of resource and accelerates monopoly.
- For more details, please read our [whitepaper session 2.1](#).

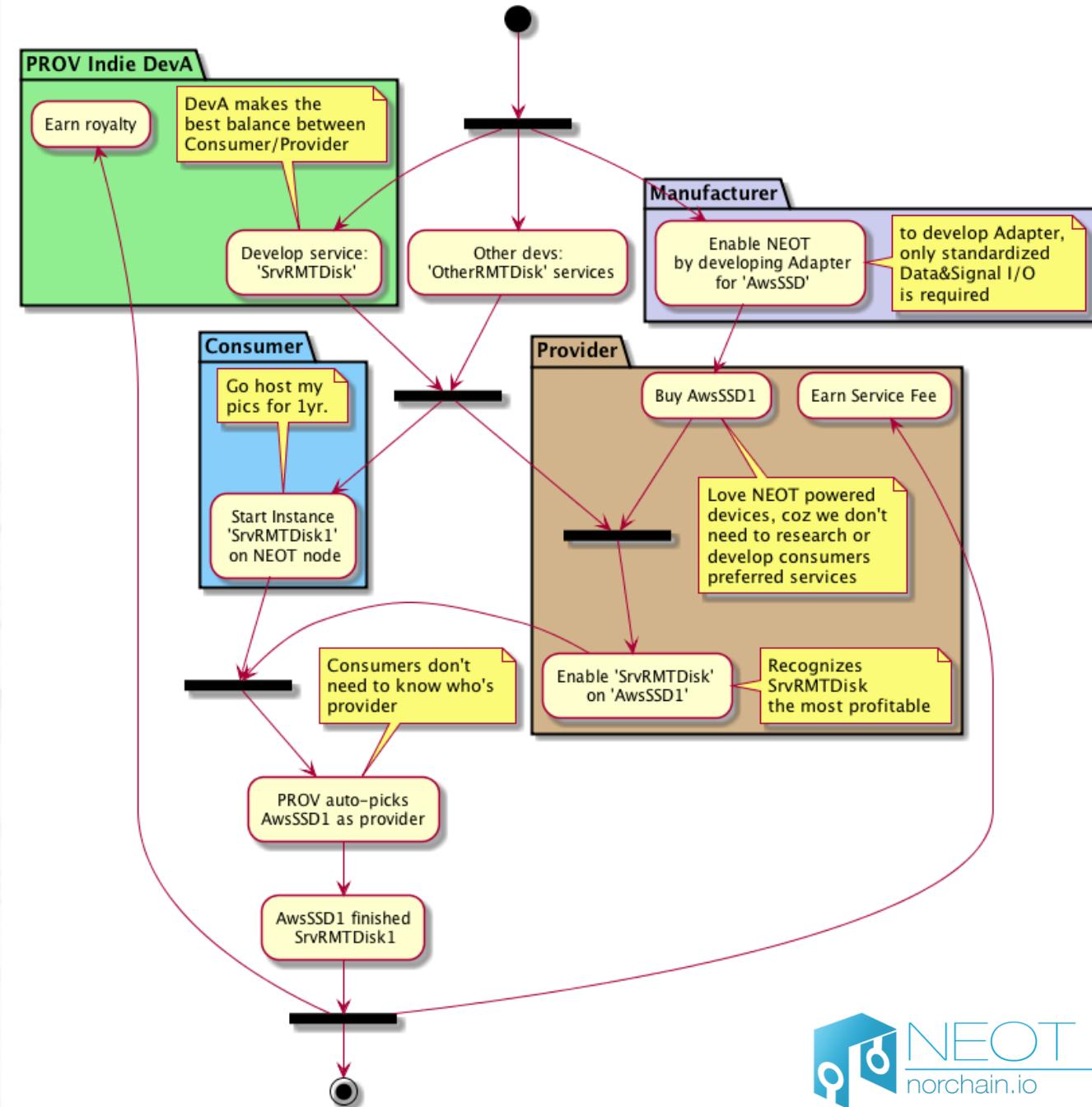


PROV: Service Model

The model of PROV

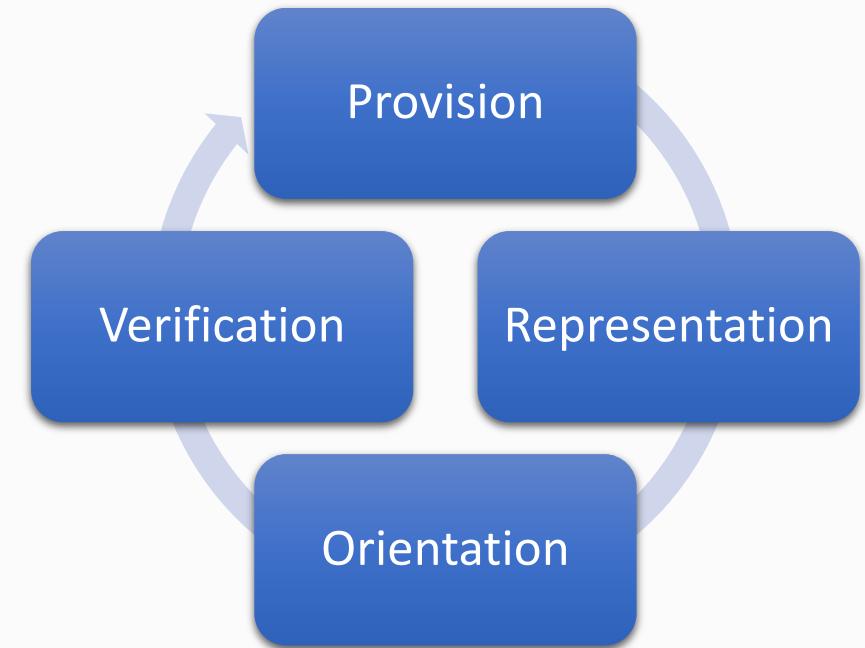
- introduces a new role: **Service Developer**,
- decouples Manufacturers and Providers from designing and implementing services;
- brings in a competitive mechanism between service developers, with which the services with reasonable logic and better tradeoff of consumer-provider interest would win more support nodes from providers and consumers;
- rewards service developers by taking royalties from every running instance of the service they wrote.

How it Works – An Example



PROV: How to implement

- To write a PROV service, developers only need to write 4 functions: **Provision**, **Representation**, **Orientation** and **Verification**.
- Only 3 types of messages are recorded on blockchain, after being verified by bookkeepers.
- Large files are transferred off-chain.
- For more details, please refer to our yellow paper:
[PROV Service and Share Economy^{\[beta\]}](#)



Verification: host example

Approach1: Random zero-knowledge verification

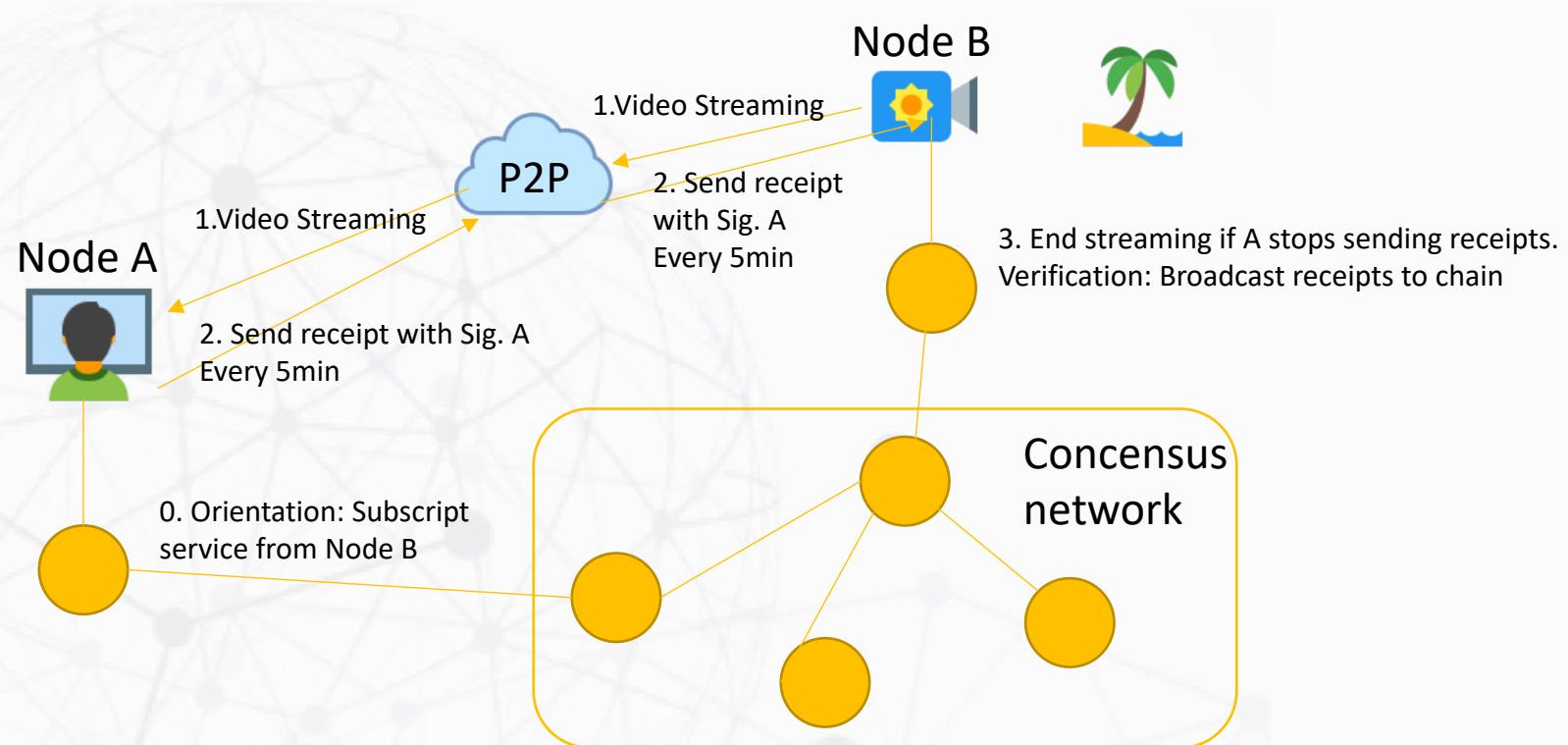
- Uploading process is happening offchain during Representation. The content uploaded is accessible for every node, but can only symmetrically decrypted by consumer.
- Consumer divides the encrypted content into n shards, puts the hash of all shards into the Orientation message of its service instance with provider's signature (Both parties agree the content is successfully uploaded).
- In the Orientation message of any subsequent instance of such service, the consumer node must randomly pickup a zero-knowledge hash result of a few shards of any existing running instances, if there is any. The shard IDs are calculated by public algorithm factored by block height.
- The orientation message will be recorded onchain. If 51% of shard verification regarding to an instance are valid, it means the provider is still working.

Approach2: Service dev acts as 3rd party

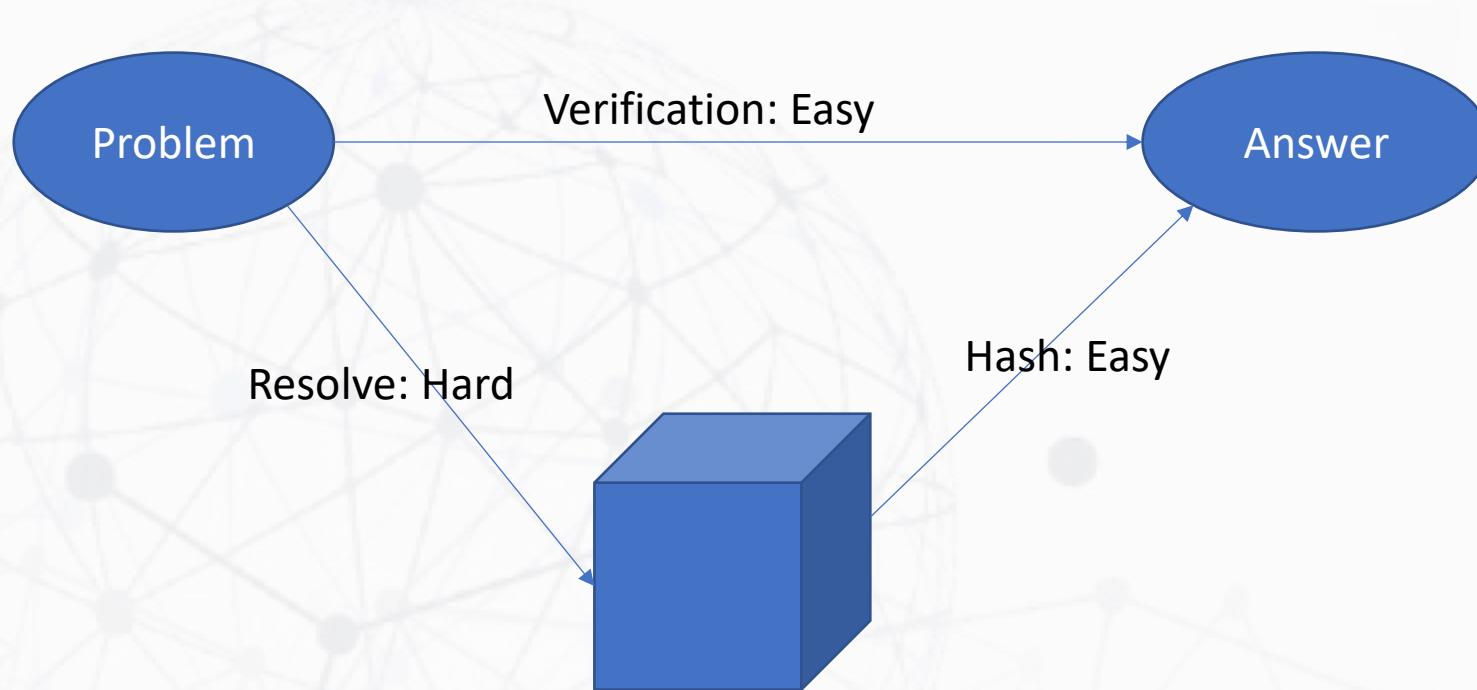
- Service dev provide an offchain server and verify the running instance periodically.

Verification: Content provider example

- Run data offchain, record receipt onchain.
- IoT content sharing example:



Verification: General proof-of-work

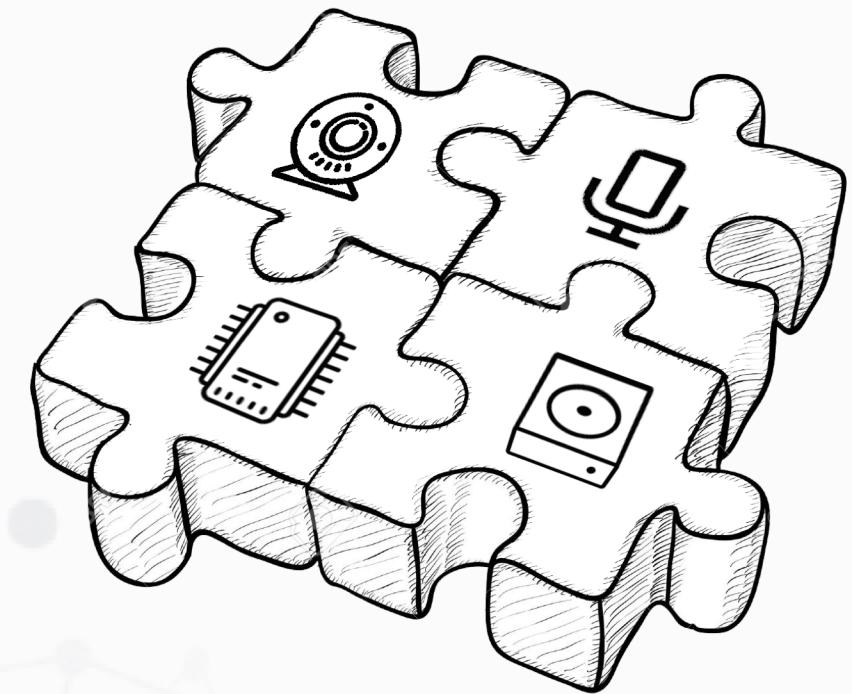


Service type: Competition

- Some services has no perfect or fixed answer. Say train a NN by gradient descent
- Orientation can support targeting multiple providers and Verification pickup the best result.

PROV Vision: Combined Service

- In the future, PROV will also support combined services.
- eg. a PROV service captures the images and voices via cameras and microphones around some place, passes the data to a remote GPU to train a Recurrent Neural Network (RNN), then stores the parameters to another SSD node.
- We'll make it happen!



NEOT = PROV + NEO

We need a distributed ledger infrastructure which

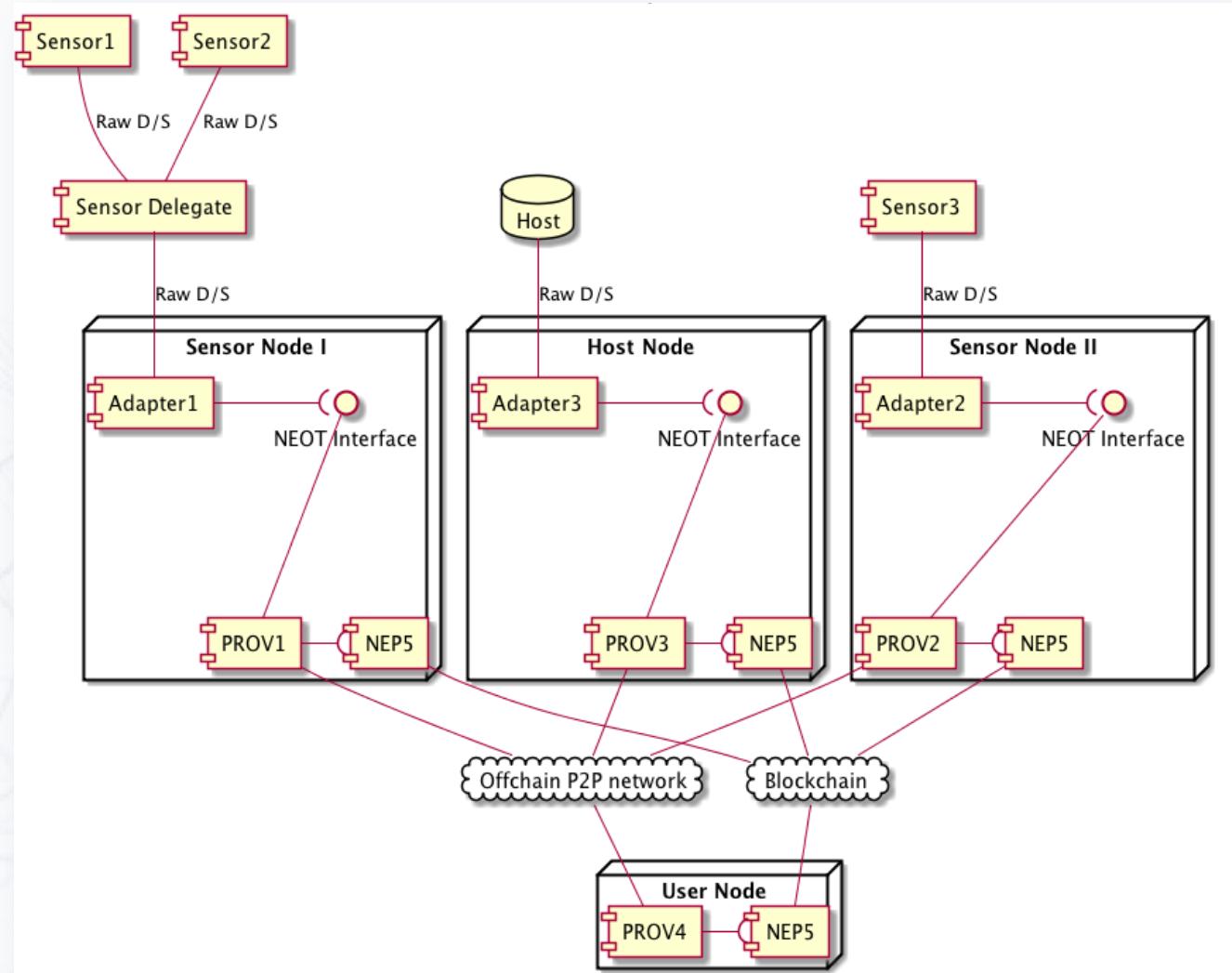
- provides **FAST** enough transaction speed,
- supports **LIGHT** nodes to reduce IoT devices' cost,
- supports **DAPPs**, so we can deploy PROV's logic.

Why NEO?

Feature	Ethereum Based	IOTA	NEO	Comments
Consensus	POW	A Little POW	dBFT	POW is eco-unfriendly. Concerns of IoT device's battery life and computational overhead.
Light Node	Developing	YES	YES	IoT Device has limited capacity.
DApp	Solicity	N/A	C#/Java/Python	Dapp support is mandatory.
Tx Fee	GAS	Free	Free	IoT needs frequent transactions.
TPS	15	1000	1000	IoT has massive nodes.
Counting System	Binary	Ternary	Binary	Binary offers compatibility and reduces overhead for almost all devices.
Ledger Incentive	Mining	N/A	Stockholders' GAS	Rational NEO stockholders maintain the value of ecosystem and are rewarded by GAS.

NEOT: The Components

- Existing sensor/host systems access PROV services via standardized data/signal interfaces brought by Adapters.
- PROV enables NEOT with both off-chain P2P network and NEP5 smart contract.
- User nodes subscribe the service from sensor/host nodes via PROV.



NEOT: Leveraging NEO

- PROV is designed to be independent from particular blockchain infrastructure. Developers can even design cross-chain services.
- On-chain records of services, providers and users are retrievable in PROV logic to improve services' quality.
- Transactions can be made via unified token globally. Payment will never be a problem.
- For more details, please read NEOT's [white paper](#).

NEOT: Overcome IoT Challenges



- Decentralized ledger is anti-DDoS in nature.
- In PROV, the service request beyond provider's provision will be ignored by blockchain.



- In PROV, consumers and providers are free to select the type of service which protects their privacies most.
- Standardized data input through Adapters also helps prevent privacy leakage before data streams to network.

NEOT: Overcome IoT Challenges



- PROV and cryptocurrency incentive will motivate manufacturers to develop the Adapters to join NEOT network.



- With P2P connection, nodes can post the message to chain through all possible connections to minimize the chance of losing signal.

ongoing cooperation

City of Markham: Smart City



PROV + NEO, as a part of the proposal of Markham City's "Smart Transportation", will

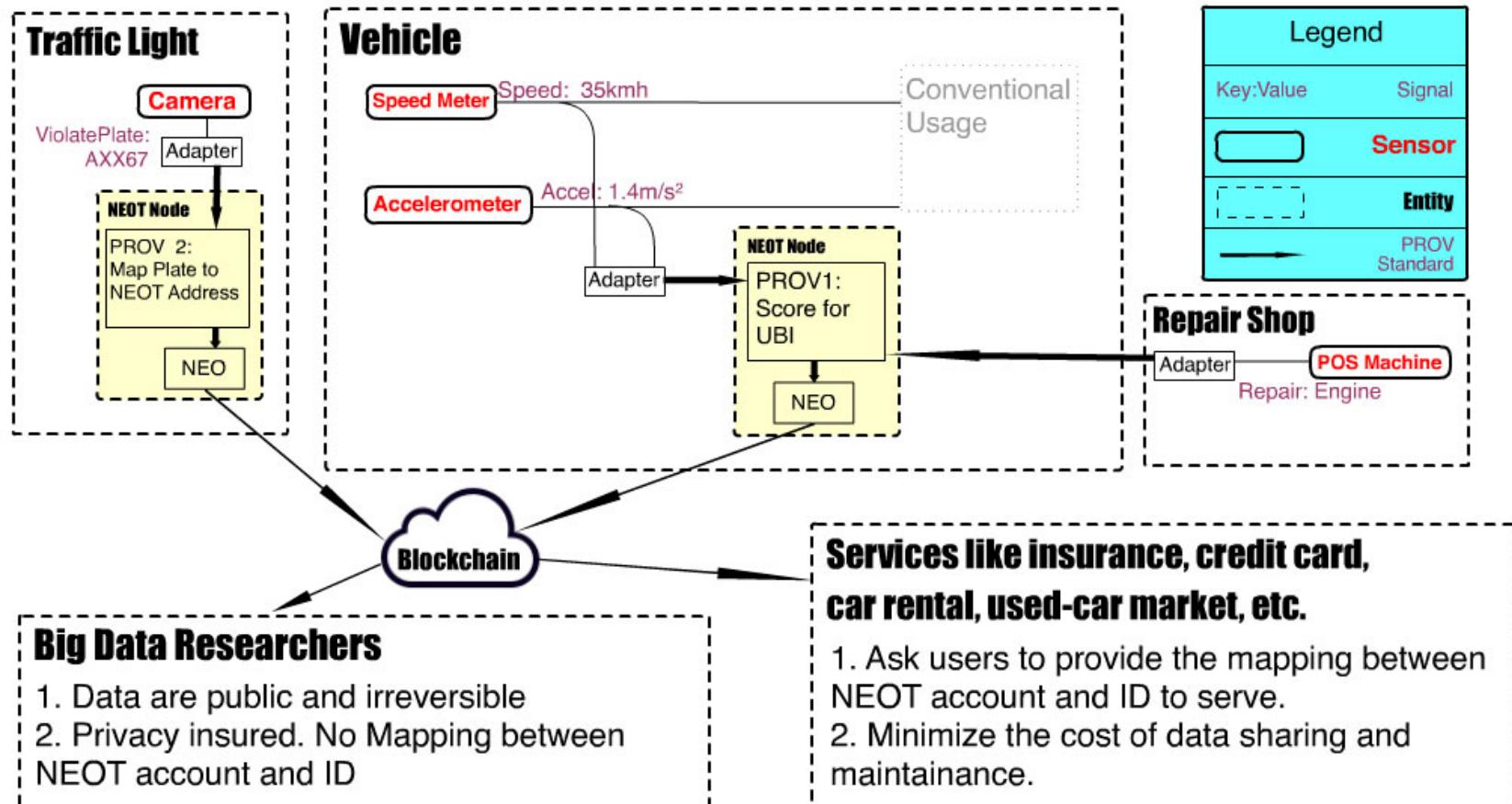
- reward drivers with safe driving habits by crypto tokens,
- allow citizens to check on-chain records to insure the privacies collected by sensors are not leaked or meddled,
- enable 3rd party big data experts to utilize on-chain records for analysis,
- provide a new credit checking reference when citizens prove the ownership of their on-chain accounts.

This proposal is also possible to run for federal government's "Smart City" Challenge.

City of Markham: Smart City



NEOT User Case: Smart Transportation



CGI: Bravo



- CGI plans to use tokens instead of dollars as a gift to the colleagues whose contribution to the company's value is recognized. The project is named "Bravo".
- Norchain's core member is the principle developer of this project and responsible to design the smart contract with elaborated requirements.

China Mobile



- China Mobile IT department plans to utilize blockchain technology to assist its NB-IoT project and data leakage prevention system.
- China Mobile Research Institute plans to enable blockchain based authentication in their mobile app.
- China Mobile IoT Company is considering to utilize blockchain EID in SIM card.
- MiGu is planning a mobile app to enable users to mine by steps. Users can redeem the “Proof of Steps” coins for the official offered prizes.

MOT: internal DB sharing



中华人民共和国交通运输部
Ministry of Transport of the People's Republic of China

- Ministry of Transport of the PRC is looking for a private blockchain solution for internal database sharing.
- Norchain has close relationship with the key officer of technical sector and is providing consultant service.

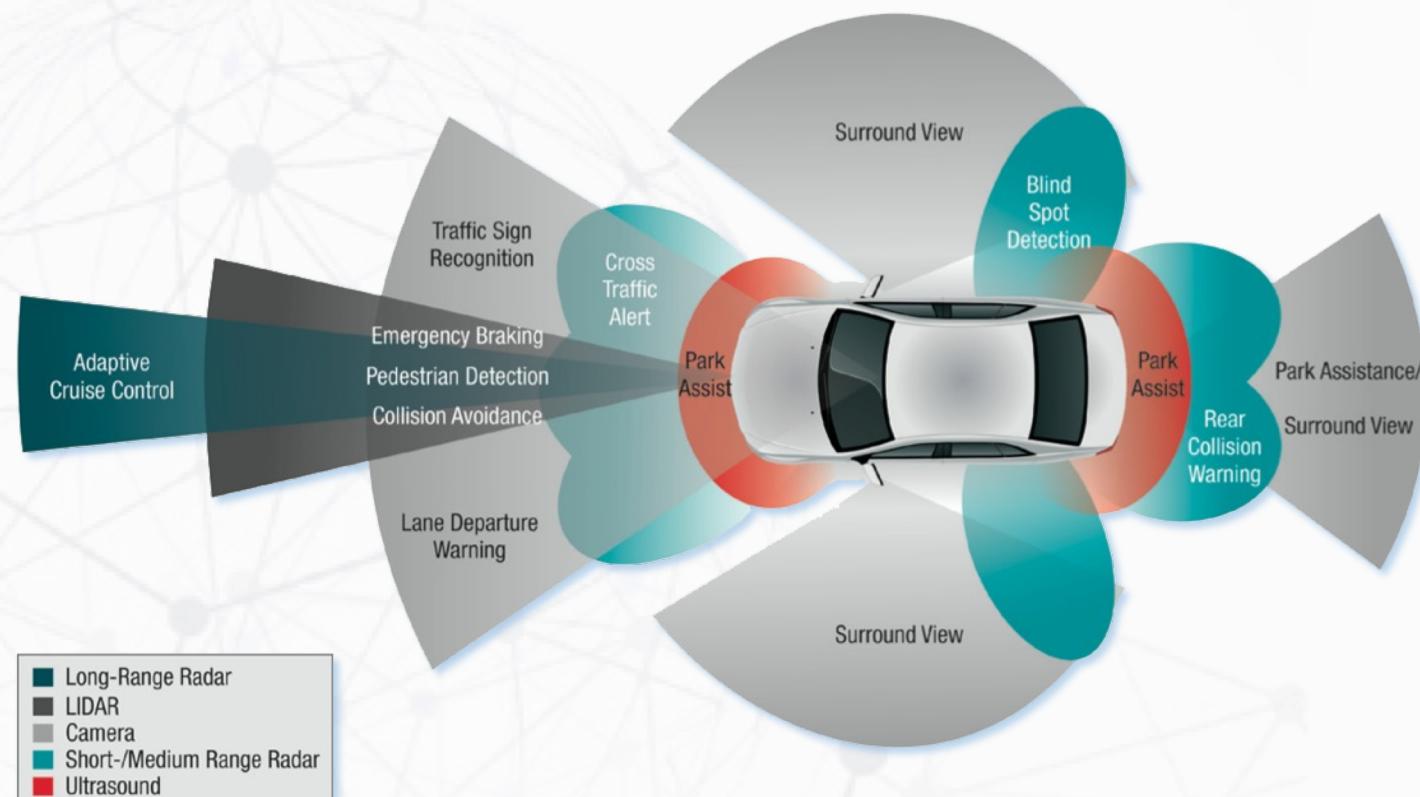
Deppon: Logistics tracking



- Deppon has the request of leveraging consortium blockchain to alleviate the waste of return-trip empty delivery resources between contract parties.
- Norchain is providing consultant service.

Self-driving vehicles and UBI

Norchain is also proactively connecting with self-driving startups and insurance companies in Toronto and Silicon Valley.





Mar. 8, 2018