Trust Anchor Group Technologies

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Abstract. This short paper provides an overview of TAG technologies, and how they are unique, where they are unique, and differ from existing technologies, where they differ or complement existing technologies.

1 Introduction

Trust Anchor Group provides technical infrastructure enabling the next generation smart society. Common in all modern visions of the Smart Society, is an Open, Interconnected, Interoperable, and yet secure network, interconnecting human and machine users with data and services, across multiple domains, from the private sector as well as government agencies, device networks and Cyber-Physical Systems. Autonomous Cross-domain interoperation on a global scale, without centralized masters, requires a new type of network, in which all participants are properly identified, and where Trust Providers assure interconnectivity is based on proper authentication and authorization in their domains of trust, in compliance with modern cybersecurity and privacy legislation. We call this paradigm Trust-based computing. It is a digital representation of how modern open human societies have evolved and are maintained: Along lines of trust. In a similar manner, interoperable computer communication must be designed to be both *open* AND *secure*.

2 The TAG Neuron™

The basis for interoperable communication across domains, is using a federated communication technology. *Federation* means technology, that uses open standards designed for interoperation across domain boundaries. Each domain is controlled autonomously, but can interact with other domains seamlessly, to create a larger whole. An example of a federated technology is e-Mail: Everyone with a domain can setup a mail server. Properly setup, each user of the mail server can then send messages to others, even if they are connected to mail-servers on other domains, if trust exists between the different mail servers.

The TAG Neuron™ is based on the federated XMPP protocol, designed for instant messaging. It allows instant communication across domains, between machines, services or humans, in a secure manner. On-top of the XMPP protocol, has been added interfaces for *Digital Identities* and *Smart Contracts*. This allows legally binding agreements to be made, between humans, between machines, or between both. This is

the basis for digitalizing modern societal operations across domains. For Interoperability's sake, the Intellectual Property of these interfaces, have been donated to IEEE, and is currently managed by the IEEE 1451.99 IoT Harmonization Working Group.

3 TAG Neuro-Ledger®

Due to problems with existing Distributed Ledgers based on Block-Chain[1], TAG has developed a novel Distributed Ledger called the *Neuro-Ledger*®. Problems with Block-Chain include problems with privacy, content-scalability, energy consumption, longevity, confidentiality and cybersecurity. Most of these problems are logical consequences of the original Block-Chain axioms of (1) using a single chain, and (2) using distrusted networks. Using a single chain makes it impossible to delete data over time. It also makes it difficult to scale content-wise. Distrusted networks require use of Proof-of-Work, which imply energy inefficiency and degenerative properties of system performance over time. It also fixes cybersecurity algorithms, which introduces longevity concerns and cybersecurity issues. By removing these two axioms, allowing a ledger to create immutable blocks of information that are not chained (necessarily), and that do now require Proof-of-Work, solves all these issues.

As the TAG Neuro-Ledger® is based on the TAG Neuron™, it is interoperable, across domains. This means that different systems, with different ledgers, can interoperate, and exchange information between each other, relating to certain collections of blocks only.

4 TAG e-Daler®

On-top of the infrastructure provided by the TAG Neuron™ and the TAG Neuro-Ledger®, exists a novel token-based instant payment system called *e-Daler*®. It is a unique instant payment system that offers *offline payments*, *micro payments*, as well as *conditional payments*. Conditional payments are payments that are guaranteed if conditions in a smart contract are fulfilled. e-Daler solves the problem of who must act first in an online transaction: The seller (who has to send a commodity) or the buyer (who has to send a payment). Using e-Daler, the buyer can send the payment, on the condition that the commodity is received. Micro-payments allow e-Daler to be used to trade small commodities between things, such as drops of water or packets of energy.

As the TAG e-Daler® is based on the TAG Neuron™ and the Neuro-Ledger®, it is federated. It is therefore possible to exchange, interact, interoperate and send conditional instant payments (including offline instant payments) across system domains, without a central master.

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[1] Blockchain and the General Data Protection Regulation. Can distributed ledgers be squared with European data protection law? EPRS | European Parliamentary Research Service, July 2019, https://www.europarl.europa.eu/RegData/etudes/STUD/2019/634445/EPRS_STU(2019)634445_EN.pdf

Technology behind e-Daler® is pending patents, and has passed review of patent offices, for its uniqueness.

5 TAG Digital ID™

The Tag Digital ID App is an App for Android and iOS that provides users with a Digital ID hosted by a TAG Neuron™ and the network of ID-related neurons hosted by TAG. The App is Open Source and can be customized by third parties and partners of TAG.

6 Paiwise™

Paiwise™ is an online payment service based on the technologies of the TAG Neuron™, Neuro-Ledger® and e-Daler®. It allows for the construction of advanced payment instructions in Smart Contracts, for smart services. This makes it possible to create agreements, where things are allowed to perform economic transactions autonomously. Such an advanced automatable payment system is unique. Primary uses include logistics and online trade, but Paiwise is not limited to these areas.

7 TAG Marketplace™

The TAG Marketplace™ is an online auction capability built on-top of the TAG Neuron™ and TAG Neuro-Ledger®, that uses e-Daler® for making transactions of physical or electronic commodities in online auctions. It allows for Industry 4.0-type optimizations of supply chains, by providing an autonomous and automatable transaction layer between buyer and supplier.

8 Neuro-Features™

Neuro-Features™ are digital assets encoded using TAG Smart Contracts and made auditable using the Neuro-Ledger™. Each Neuro-Feature™ has a unique owner at any given time. Ownership transfers are performed using smart contracts, which can include Paiwise™ contractual payments to automate payments. This also creates a record in the Neuro-Ledger™ that can be used to monitor and validate the value of assets over time. Neuro-Features™ can be used to create Non-Fungible Tokens (NFTs) and Asset-backed Tokens.

9 Summary

Trust Anchor Group provides a series of technological infrastructure components that makes it possible to create open, interoperable and secure networks for smart

societies. Some of these technologies are developed to be open and interoperable, with intellectual property donated to public organizations, for maximum transparency. Other technologies are property of TAG, with proven uniqueness. For any technical questions, contact the author.