

Enabling Governed Distributed Security & Trust in 5GZORRO

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Concept of Trust in a 5GZORRO Governed Distributed Environment

One of the key challenges of obtaining trusted entities in a non-centralised ecosystem is the **proof of identity**. These need to be standardised across the whole distributed platform, in order to avoid compatibility and segregation issues through the potential interactors. Thus, we're effectively enabling businesses on a much larger scale.

In 5GZORRO, we intend to develop a **Governed security and trust platform solution** which is capable of implementing multi-domain and multi-stakeholder smart resource selection and trading, by providing **digital identities** rooted on a **blockchain** through a Distributed Ledger, so that they are interoperable across several marketplaces. By providing such a system, we are aiming to further develop and embrace the decentralisation of identity.

As far as key concepts go that are at the forefront of the Governance platform, these are as follows:

- Usage of a **Distributed Ledger Technology (DLT)** that is purpose-built to handle decentralised identities, driven by the **Verifiable Organisations Network (VON)** [1]
- Unique **W3C Decentralised Identifiers (DIDs)** [2] that are issued by one of several Governance Administrators without requiring any centralised resolution authority
- Establishment of **secure connections** between any two entities to create non-corruptible one-to-one relationships
- **Virtualized solution** which can enable multiple stakeholders, across **different geographical areas**, to trade/lease heterogeneous resources, such as spectrum, edge computing, network, storage, and virtual network functions (VNF/CNF).

Application of DIDs & Verifiable Credentials on a Marketplace

By leveraging emerging standardised **Distributed Identifiers** and **Verifiable Credentials**, we are capable of managing global and unique identifiers in Telecommunication ecosystems, identifying and authenticating entities, services and organisations, and authorising consumer requests to access preserved services and resources.

W3C's Decentralised identifiers are a new type of **identifier standard** that enables Verifiable, Decentralised Digital Identities. These DIDs can be attributed to Stakeholders, Organisations, Commercial Licences, and more, as this is determined by the Governance Platform that issued said DID. Unlike Federated Identifiers, DIDs have been designed so that they may be decoupled from Centralised Registries, Identity Providers, and Certificate Authorities.

A W3C's Verifiable Credential [3] is the **digital representation** of all the information manifested by a Physical Credential, in an interoperable format to enable the exchange of digital identity attributes and relationships. These can have a very diverse range of Representative purposes, such as:

1. Information regarding the **Verified Entity** in the blockchain, i.e., Organisation, Stakeholder, etc.
2. Information of the **Issuing Authority**, such as a Certification Body or a Regulator of a Marketplace
3. Information on the **type/purpose of the Credential**, i.e., Spectrum Licences, Service Level Agreements (SLAs)

Technologies that reflect trustworthy signatures, providing more convenience than physical counterparts when trying to establish trust at a distance, makes **DLT-based Verifiable Credentials** a very interesting solution for the ongoing worldwide Digital Transformation, with the inherited benefits of creating new business propositions, and innovative products.

High Level Architecture with Governance in Use Case Applications

Taking into account the concepts behind the Governed aspect of 5GZORRO, we present a High-Level Architectural overview of the Cross Domain implementation involving the Governance Platform (see Figure 1) that is being continuously validated in the Use Cases [4].

Besides the Governance Sub-System, there are 3 other essential perpetrators that provide critical functionalities across the whole platform, but we'll briefly tackle the main aspects of what constitutes the Governance Platform in 5GZORRO.

The communications between the existing domains that involve blockchain operations such as establishing secure connections between Agents, and request and issuance of Credentials, are supported by the DLT Governance VON, that enables concurrency handling and Agent wallet registration. As far as remaining Protocols concern, especially peer-2-peer DID Communications, these are managed by the Identity & Permissions module, that is present in every Agent's domain.

It should also be noted that there are certain functionalities from other Sub-Systems that require the presence of Governance, i.e., establishing secure channels for Operators to trade, and marking Service Level Agreements (SLAs) for the Operators' Catalogue. Since the Sub-Systems are divided throughout the whole platform Domains, these integrations are facilitated, by providing more direct communications, reducing risks of attacks such as Man-In-The-Middle (MitM).

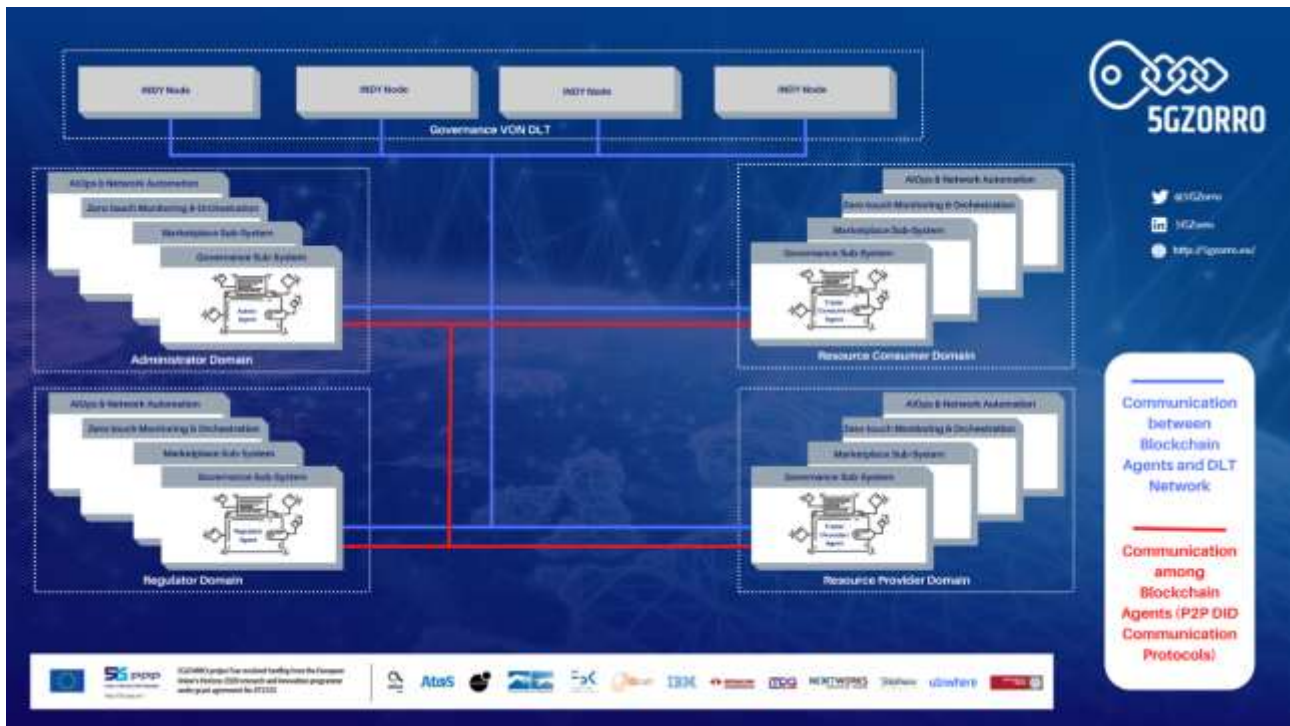


Figure 1: 5GZORRO Governance Platform applied to several domains

Across these Domains, there are 3 main types of decentralised Agents that constitute the Governance Sub-System:

1. **Admin Agent:** This Agent provides specific business logic to manage **Governed Verifiable Credential requests**, which include credentials about applying to 5GZORRO stakeholders Marketplace **membership**, and also to be used to issue said regulated **Onboarding Verifiable Credentials**, following **Trader Agents' requests**
2. **Regulator Agent:** This next Agent provides specific business logic to manage **VC requests** only of the Marketplace **Licence type**, with capability to issue said regulated **Licensing Verifiable Credentials**, following **Trader Agents' requests**
3. **Trading Agent:** Finally, this next Agent provides specific business logic to request Verifiable Credential issuances of both **Onboarding & Licensing types**, required to support trustworthy trading of 5G Offers in 5GZORRO Marketplace. Unlike the previous 2 types of Agents, Trading DID Agents will **not be able** to issue Verifiable Credentials. Trading Agents will be onboarded on the Marketplace & registered in the Governance DLT via **Admin Agents**

Trading Agents will be attributed Licences on the Marketplace & register them in the Governance DLT via **Regulator Agents**. This Agent can have two segregated roles: **Provider Trading Agent**, where it acts as a seller of resources, **Consumer Trading Agent**, where it acts as a buyer of resources

Trading Agents communicate among other Administrator/Regulator Agents through **Peer-to-Peer DID Communication protocols** to request and resolve Verifiable Credentials, respectively. The communication between the Blockchain Agents and the DLT is possible thanks to the **Hyperledger INDY** project [5].

References

- [1] Verifiable Organisations Network: Global digital trust for organisations, available online at <https://vonx.io/>
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- [3] Verifiable Credentials Data Model v1.1 W3C Recommendation, available online at <https://w3c.github.io/vc-data-model/>
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- [5] Hyperledger INDY - Distributed Ledger Software, available online at <https://www.hyperledger.org/use/hyperledger-indy>

Follow our updates on www.5gzorro.eu and on GitHub at <https://github.com/5GZORRO>.

