

A Blockchain-based Distributed Paradigm for Data Exchange Between Wireless-based Devices

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Abstract

The exponential growth of wireless-based solutions has led to countless advantages in every area of our society. Such a scenario has transformed the world a few decades back, dominated by latency, into a new world based on an efficient real-time interaction paradigm. Cryptocurrency has contributed to this technological revolution, whose fulcrum is a decentralization model and a certification function offered by the *blockchain* infrastructure. Our work is aimed to indicate a possible approach to exploit this challenging scenario synergistically by introducing a novel blockchain-based distributed paradigm for data exchange between wireless-based devices, defined *Internet of Entities (IoE)*. It relies on two core elements with interchangeable roles, *entities* and *trackers*, which can be implemented by using existing infrastructures and devices, such as those related to *smart-phones*, *tablets*, and *IoT* systems.

Scientific Contribution

Entity and Trackers

We introduce the concept of *entities* and *trackers*, able to exchange roles, which operate within a *wireless-based* environment.

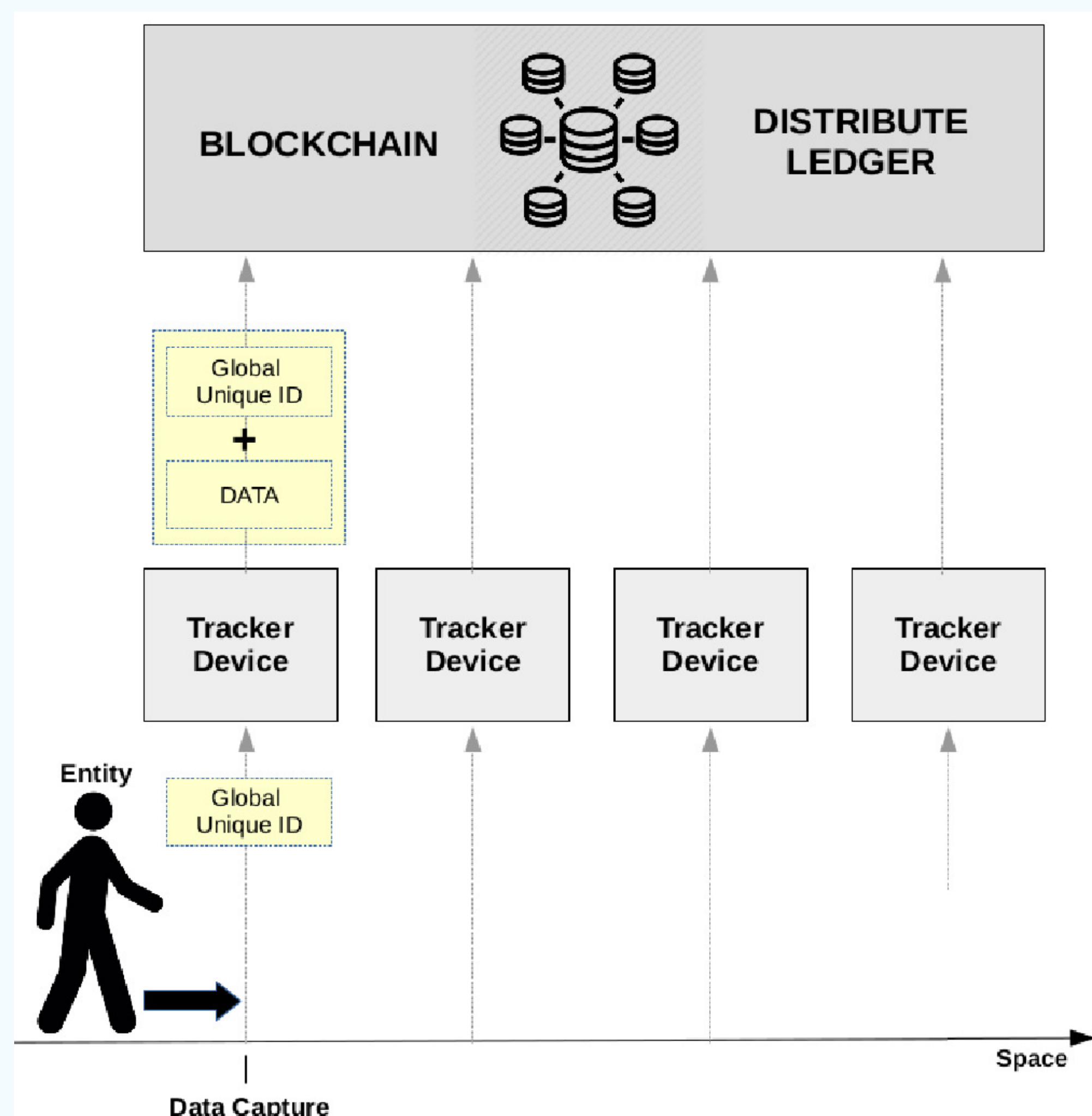
Interaction Model

We define the interaction model between *entities* and *trackers*, and *trackers* and *blockchain-based distributed ledgers*.

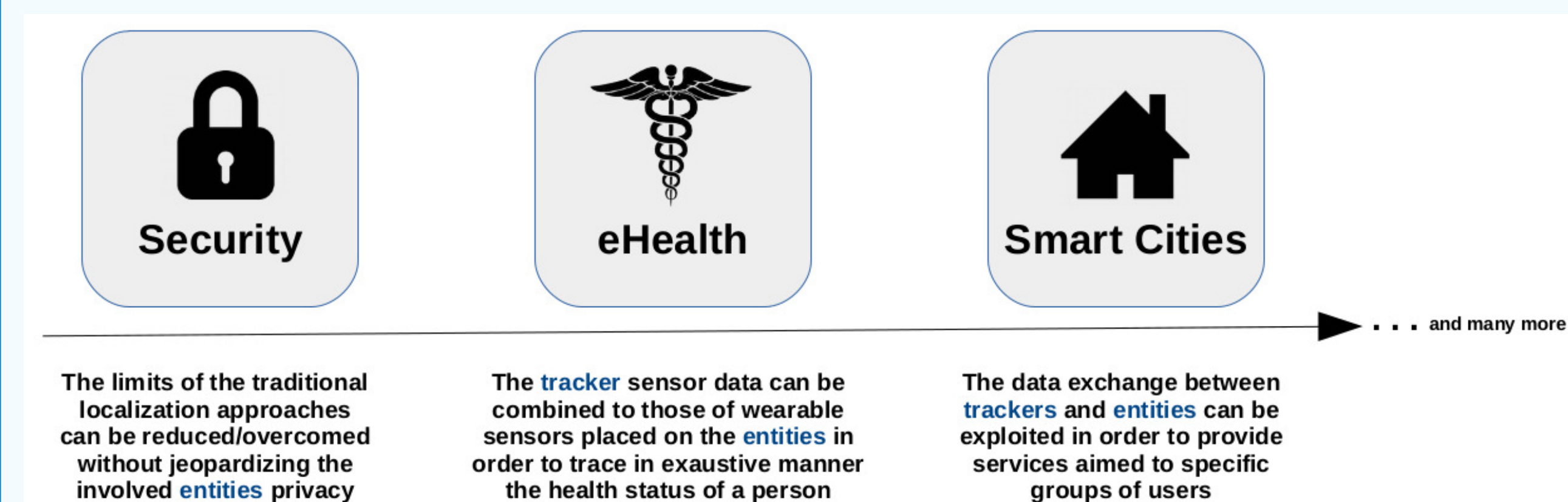
Communication Protocol

We formalize the *entity-to-tracker* and *tracker-to-blockchain-based distributed ledger* communication protocol data structures.

IoE Working Model



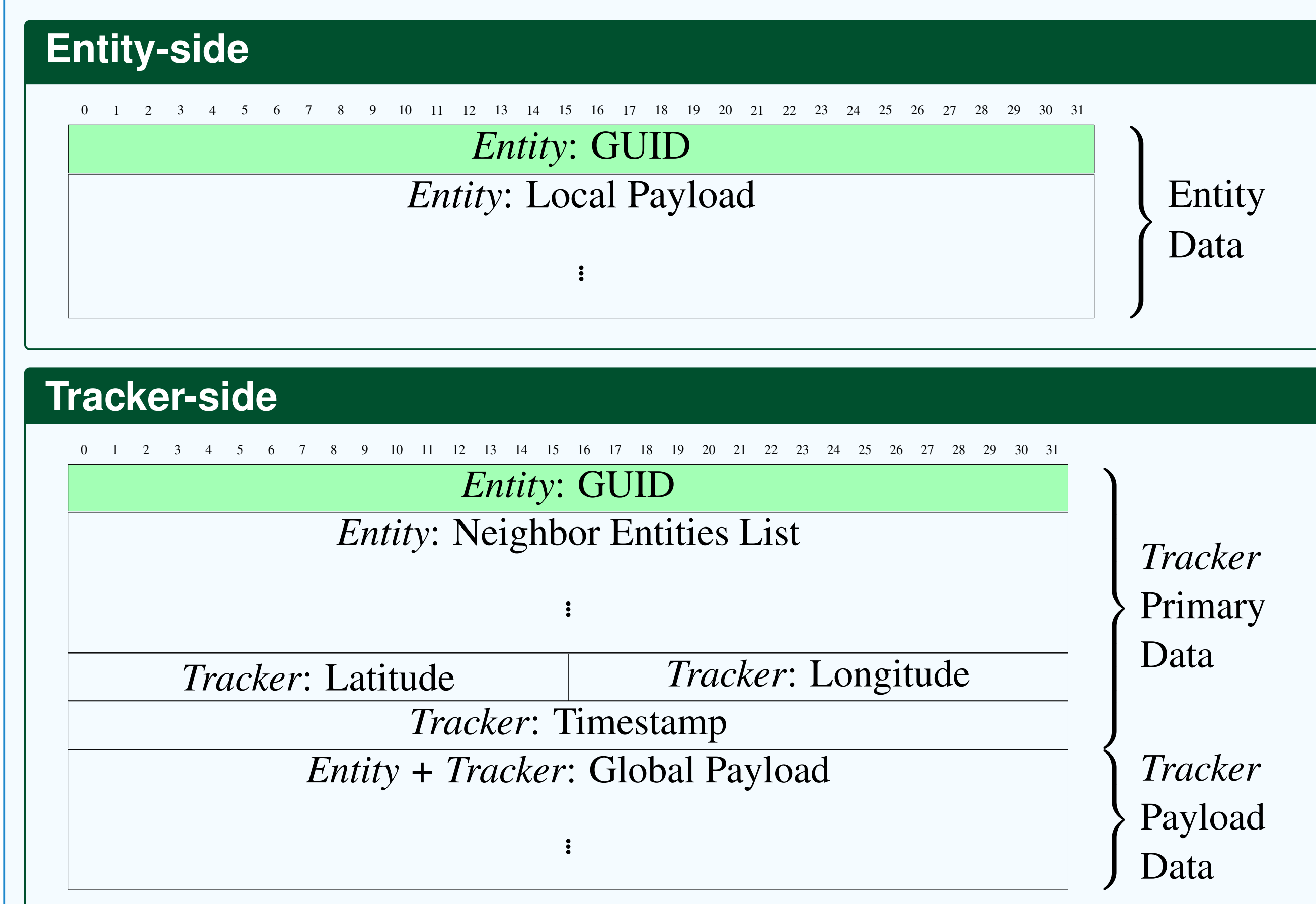
IoE Application Area



Implementation

The implementation of the proposed paradigm can be made by adding simple features to the existing devices used as *trackers* (*IoT*, *smart-phones*, etc.), since we only need to append few *entity* data (i.e., *unique identifier* and *sensors data*) with few *tracker* data (e.g., *time-stamp*, *geographic location*, *sensors data*, etc.) and sent them to a *blockchain-based* distribute ledger. It should be observed that in case of mobile devices, such as *smart-phones* and *tablets*, this operation can be easily performed by installing an application.

Data Structure



Final Considerations

- ▶ We introduced a novel data-exchange paradigm able to join the capabilities provided by the *wireless-based* devices environment with the certification ones provided by the *blockchain-based distributed ledgers*.
- ▶ It is based on two core components, *entities* and *trackers*, which are billion of existing devices able to operate across the *IoE* environment, interchangeably.
- ▶ Although such a paradigm is based on existing and wide spread technologies, it provides a novel method to trace the activity of an *entity* in a certified and anonymous way, by combining the *wireless-based* and *blockchain-based* technologies, producing valuable, exploitable, and (if needed) investigative-valid data.
- ▶ The opportunities related to the *IoE* paradigm grow day after day thanks to the continuous introduction of new *wireless-based* devices, which provide an ever expanding *IoE* coverage area.
- ▶ In summary, the proposed *IoE* paradigm can be easily implemented by exploiting existing and wide spread technologies and infrastructures, providing a series of advantages for the community, since it can be exploited in many real-world scenarios.

Acknowledgements

This research is partially funded by: *Regione Sardegna* under project *Next generation Open Mobile Apps Development (NOMAD)*, *Pacchetti Integrati di Agevolazione (PIA) - Industria Artigianato e Servizi - Annualità 2013*; *Italian Ministry of Education, University and Research - Program Smart Cities and Communities and Social Innovation project ILEARNTV* (D.D. n.1937 del 05.06.2014, CUP F74G14000200008 F19G14000910008).