



Blockchain empowers the citizens of  
the Smart-City.

Governing the network with a collective interest cooperative  
company

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## Why this white paper?

**The Smart-city** will be a decisive issue for public policies in the coming decades. It aims to optimise the implementation of metropolitan public services, with the double objective of increasing urban well-being and controlling public spending.

The management of personal data is at the centre of this ambition. A better quality and quantity of information concerning different uses will allow public and private actions in urban areas to be adjusted accordingly. However, before any production, management or use of the data takes place, the data needs to be organised to make it confidential in order to protect individual freedom.

The blockchain, a breakthrough technology, coupled with a cooperative legal framework, (SCIC), allows the technological promise of the 21st century city to be combined with respect for the individual.

Through this new lense, the GDPR is no longer a constraint for the Smart-City but a lever for citizen initiatives. In fact, thanks to the blockchain, the data of RGPD-certified users can be made use of by the users themselves when dealing with public and private operators (thanks to the SCIC). In this way they will be able to contribute to defining local public services.

**Civis Blockchain** is an association of blockchain experts and lawyers, who have a visionary project, which will encourage officials, private companies and citizens to cooperate together to build the public services of tomorrow.

**This white paper** proposes a complete technological and legal implementation method for the data management of smart-cities. It is a user manual that explains why and how to use the blockchain and the SCIC to respectively technologically and legally govern the Smart-City network.

The Blockchain and the SCIC are two sides of the same coin whose purpose is to give citizens back political power at the metropolitan level.

# The blockchain, a technology for managing data exchange in a smart-city

## 1. The Smart-City

### 1.1. A smart city for the citizens

Tomorrow's cities will need to be sustainable. Data concerning the use of urban facilities and services will be used to measure, control, compensate for, and even predict their societal and environmental impact. For this, it is necessary to provide a means for data providers to de-compartmentalise urban service provision.

**How ?** By implementing a data management technology that not only promotes the development of innovative systems and services that interact with each other to the benefit of citizens, but also to the benefit of urban service operators, businesses and the environment. A project of this type is both fueled and the driving force behind the local digital ecosystems dynamic. It is also a way of reinforcing the sectors of excellence in the cities which come under the label "Métropole French Tech".

### 1.2. GDPR compliance

The twentieth century has been the century of the right to health. In around a hundred years Europe has developed a medical thinking concerning the protection of the human body accompanied by a system for collectively funding this. The twenty-first century will certainly be the century of protection rights for the intangible side of human life, with real "protected data pathways" like care pathways.

Personal data is an invaluable asset that must be protected and valued. The GDPR opens a new political era that will take us out of the "black market" of personal data, where masked exploitation is the golden rule of GAFAM, towards an economy that protects and emancipates. People must be able to manage their intangible capital in the individual's and general interest.

Smart Cities are at the heart of these changes because they aim to make use of this intangible aspect. In other words, Smart city users' personal data will not only serve to improve traditional physical public services but above all, the data will serve to create new forms of public services, in the form of "public assets".

The personal data protection regulation introduced by the GDPR is an opportunity to create a local common good of a new kind from scratch: local public intangible assets. Data protection will therefore encourage citizen dynamics. The GDPR, which will be played out on the Blockchain and orchestrated by a SCIC, turns out to be a lever for action and not a constraint.

As of May 2018, local administrative authorities have specific legal obligations, in particular, in the designation of a Data Protection Officer (DPO). This officer is not physically appointed by law, but the structure or the person which carries out this mission must conform to specific criteria. The Smart City must foresee the DPO's ability to manage and understand these new intangible public services.

### 1.3. A real opportunity for the smart city

By using the blockchain as the infrastructure of the Smart City, metropolitan cities will be able to attain the objectives they have set for themselves.

First and foremost **economic development** will be encouraged by making regional data available and accessible to companies. The use of the blockchain will help develop innovative services and create an entrepreneurial ecosystem for data use.

Secondly, it will enable data to be managed under **a shared vision and integrated approach**. Thanks to the traceability and security offered by blockchain technology, data can be collected and used in real time. The decentralized nature of the network will make it possible to better pool, coordinate and optimize various urban services without excessive investment in infrastructure.

The implementation of **inclusive governance** will enable cities to involve its citizens throughout the process. This will bring them full transparency and real cooperation in the construction and evolution of the sustainable city.

### 1.4. Data convergence as innovation enabler

The use of Big Data and the use of artificial intelligence is of no real interest without a common infrastructure which allows information to be shared and managed. Indeed, it is essential to provide **information that can be trusted, while maintaining traceability and transparency concerning the use of that information**. Citizens and businesses will be able to manage the data and use it to offer and services.

Blockchain technology is a simple and powerful way to make cities truly sustainable and smart. By guaranteeing trust and control in the circulation and use of data, it brings out a new economy of access. Thus, data from different sources can be shared without being displaced and thus contribute to the emergence of new solutions in a measurable way.

Thanks to the blockchain, **the automation of data processing, transparency of source codes, data encryption and the use of standards** make it possible to create a data exchange platform which is secure and respectful of privacy. The information produced by the city is disseminated to urban service operators, businesses and / or users, through **self-executing contracts**. Access to these contracts will only be possible by using the **private keys of the users who own the data** (public, private or individuals). Thus any use of the data will require the **prior authorization** of its owners. The blockchain is a pragmatic solution and fully compliant with regulations concerning personal data.

Finally, it is a **big step towards "open" innovation**, as research centers, large groups, SMEs and local start-ups will be able to access this data thanks to a standard and open protocol. Thus, this valuable value-creation ecosystem will play a central role in the development of novel applications and appropriate business models.

## 1.5. Opening up new usages and organizational models

The use of a blockchain to manage data exchange in the smart city will not only help to protect citizens concerning the use of their personal data but also encourage new uses and new business models.

Here are some ways in which blockchain technology could allow the smart city to offer new services:

**Interventions on the road network:** combining data concerning weather, cultural or sporting events, with transport network analysis tools along with personal data which has been anonymised thanks to blockchain technology, would, for example, allow traffic flow to be adjusted as well as interventions by road crews to be adjusted, while also taking into account real-time traffic.

**Energy efficiency:** This example of energy saving is frequently cited as this experimentation was already carried out in 2016 in New York. About fifty people in the Brooklyn neighborhood created a micro-network for the production, exchange and resale of photovoltaic electricity between neighbors using Blockchain technology. Using this technology on a citywide scale would help reduce grid costs by creating a system which links production and local consumption. On the scale of a metropolis, one could even imagine that a suburb which receives the morning sun could exchange electricity with a suburb which receives afternoon sun. These exchanges would be carried out in a secure way through the intermediary of inter-city contracts and without using money.

**Charging electric vehicles:** a network based on the blockchain would simplify the management of charging electric vehicles. Each user could connect to any terminal via a mobile application. The terminal would then automatically organize the payment at the best price for the energy which had been consumed. Induction chargers could be installed at traffic lights to allow vehicles to charge while they are waiting and payment could be organised in the same way.

**Parking:** Blockchain technology could be the key to eliminating parking problems and allowing a new business model for parking. Using blockchain technology and smart contracts, an application could allow garage or parking space owners to rent their parking space by the month, hour or day.

**Smart Buildings:** There are large challenges concerning construction in the smart-city.

The use of the blockchain could make it possible to create tools based on digital models, accessible to local authorities. These applications on the smart city's blockchain could allow administrative documents to be certified at each stage of the construction process or to ensure that data produced by the building when it is operating is shared. Thus the blockchain will accelerate all planning projects and create a new model for data generated by smart buildings.

**City facilities:** data produced by sensors on the city's facilities could be made available for use via the smart city's blockchain and be used to implement services which will optimize the use and maintenance of these facilities. Anonymized data could be used to better understand, for example, the uses of different low flow networks or to control urban facilities (lighting , video surveillance, traffic flow, information panels) using artificial intelligence.

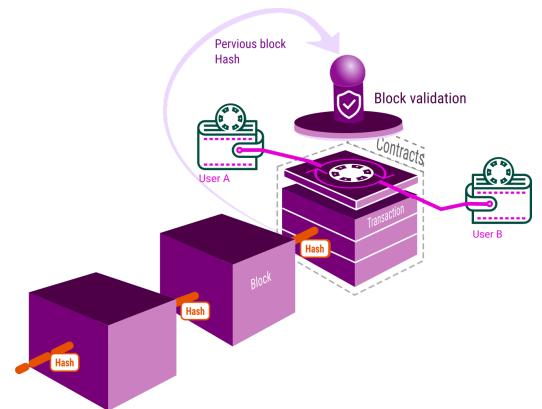
**Inclusion of citizens in governance:** The use of the blockchain is based on a personal data portfolio that could itself become a point of access and information concerning the smart city for the citizen. The citizen could make use of tools to understand different issues, form an opinion on the choices to be made, ask questions and express his opinion through a voting college that would represent him.

Other cases of practical use are presented at the end of this document. They illustrate in greater detail the possibilities for optimizing the city's services, exchanging personal data and encouraging eco-citizenship.

## 2. The Blockchain

### 2.1. What is a blockchain ?

A blockchain is a database of distributed, secure transactions, built by consensus, combined with a system of self-executing contracts that govern transactions.



This structure has two key advantages over traditional centralized databases:

- on one hand, it guarantees the integrity and the real-time traceability of the data, which allows an efficient and transparent collaboration between the users,
- on the other hand, self-executing contracts (smart contract or chain code) make it possible to automate and secure processes, which leads to efficiency gains.

**There are two types of blockchain:**

**Public blockchains:** they originated at the same time as crypto-currencies and use different systems of consensus to guarantee data integrity. They pay the entities who are in charge of validating network transactions. This mechanism allows these blockchains to free themselves from governance and to guarantee a very high degree of transparency. The possibility of reading and writing new transactions is permanently possible to all. In reality, for blockchains that allow the execution of smart-contracts, there are generally foundations that ensure the maintenance of the network, as well as the development of the eco-system and governance modalities.

**Permissioned blockchains:** they are a much more general use of the blockchain principle. They are mainly used in cases where complete decentralization or the use of a cryptocurrency is not necessary, even embarrassing because of the fluctuation of the currency. They also make it possible to manage the distribution, and therefore the protection, of personal data.

### 2.2. The blockchain as the backbone of the data economy

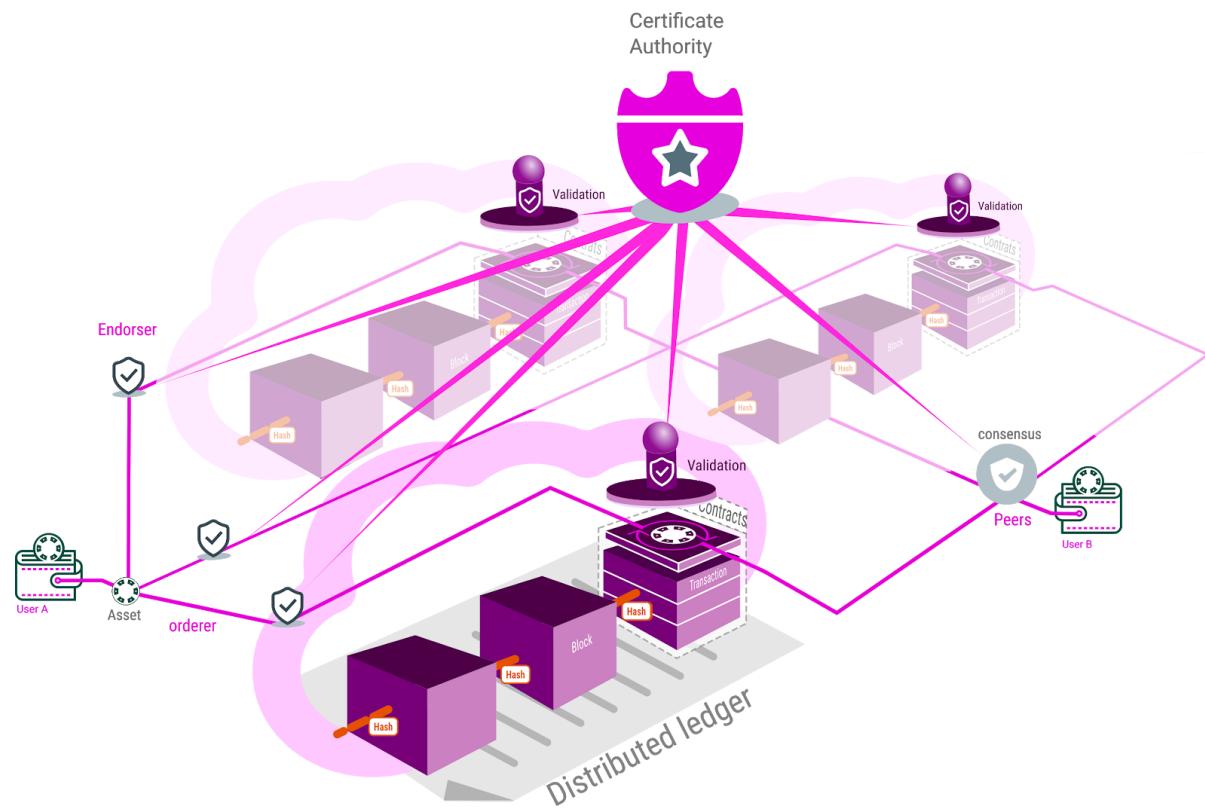
**The blockchain makes it possible to secure and control the use of the data** by adding an encryption system and controlling the user's (producer) access to data. It is thus possible to give temporary or definitive access to very precise sets of data. This access is managed through contracts. Each use of the data can thus be recorded with confidence. A new data economy, based on access and use, can thus be developed.

## 2.3. Permissioned blockchains

Permitted blockchains are **particularly suitable for Smart City use**. They make it possible to create a made-to-measure blockchain which integrates parts (channels) which are common to several applications or datasets. These channels can be public or private depending on the confidentiality of transactions and the modalities defined between users and suppliers.

### The structure of a permissioned blockchain :

Permissioned blockchains work similarly to public blockchains. Here's, roughly, how they are structured:



- The **ledger** is a database listing all transactions. This database is replicated on all validating servers. Each transaction line contains a code (hash) generated from previous transactions that guarantees its integrity (chaining principle). Transactions are grouped into packages and validated by controllers to create so-called blocks. The result of transactions is communicated through messengers.
- **Users** have an account (wallet) to access transactions on the blockchain. They can therefore be end-users or service providers who used or offer services via the blockchain.

If they have sufficient rights, they can execute a transaction. Sometimes these transactions must be paid for. This is where the idea of tokens comes in. Tokens are a type of credit which can be bought by a user to pay for contract execution.

- **Smart contracts or chain codes** are a piece of code on the blockchain (?) which allow the precise way in which the contract will be carried out to be defined. This code can use external data, if necessary, can be based on other contracts or trigger the execution of other contracts. In the case of the Smart-City, the smart code or chain-code defines the way in which a user can interact with, and have access to, a dataset.

- **Endorsers** are mechanisms that validate (sign) the authorizations to perform transactions and initiate the execution of a contract. The overall validation of a transaction is done by checking that after each transaction, all the endorsers obtain the same ledger.

- **Orderers** help to create a communication channel between the user and the contract, to guarantee the integrity of the contract and to communicate the result of the execution to the user. In our case, they provide the user with the data he or she requested. Several validators are used to certify a transaction. The geographic and technical distribution of these validators guarantees that the network is trustworthy.

- **Certificate authorities** are special accesses which give users access rights which have been checked by endorsers.

To summarize, permissioned blockchains are managed by the entity which has the administrator role. It makes it possible to regulate users' access to contracts and, in the case of the smart-city, to data. This administrative role can obviously be divided, delegated or shared out to create governance rules.

## 2.3. The blockchain project, a collective initiative

To implement a blockchain project, a metropolis must depend on technical expertise from specialised people, but it will also need to integrate each actor in the co-construction of the blockchain network, in order to make the project inclusive.

**In fact, the ecosystem plays an important role** since the very interest of the blockchain is to include each of the actors in the functioning of the decentralised infrastructure.

Because of this, **data providers** (such as metropolitan areas, the State, mixed- economy companies providing facilities and equipment, public industrial and commercial company, associations, private company actors) will find **a way to transparently control the use and sharing of data that they produce**. This data can thus be used and interpreted by data consumers.

Thus it will be a whole collection of different companies who will be able to connect to this blockchain in order to develop their services and create new offers for users. For this decentralized infrastructure to work, its governance must be inclusive and aligned with the interests of each of the stakeholders.

## 2.4. A technology designed for the new challenges in data management

### AI

The evolution of Artificial Intelligence (AI) which will greatly contribute to the potential of the Smart City to develop.

The production, storage and dissemination of structured data is **a major prerequisite for creating a data economy**. The blockchain facilitates access to data. It builds on existing storage structures to standardize and secure them. This technology makes it possible to set up collaborative governance platforms, based on the cloud infrastructure of data producers, who will have the essential components for the complete data processing cycle at their disposal. In this way it thus promotes a transparent structuring of the treatment carried out by IA actors in different sectors in different regions.

Data traceability makes it possible to create close links between algorithmic processing. These platforms will bring different professional sectors together: data holders, problem holders and researchers from the academic and industrial world. They will give industrial actors the infrastructure and data needed to implement sustainable actions

The blockchain is a tool which can **bring all the actors concerned with AI and Big Data** in a particular region together. The implementation of blockchain projects creates synergies between the different actors in a region and so leads to data economy.

### GDPR

New European regulations concerning the management of personal data (GDPR) require the appointment of a **Data Protection Officer** for:

1. Authorities or public bodies
2. Organizations whose core activities lead them to carry out regular systematic of people large-scale monitoring
3. Organizations whose core activities lead them to deal at a large scale with so-called "sensitive" data or data relating to criminal convictions and offenses.

As seen previously, a private blockchain is administered by a person who holds authority certificates. This person is in fact "responsible for the processing" of data under Article 4 of the European Regulation. He or she is "the physical or legal person or public authority, service or any other body which alone or jointly with others, determines the purposes and means of processing". The governance structure of the Smart City blockchain is therefore clearly subject to European regulations concerning the management of personal data and must include a delegate who is responsible for data protection.

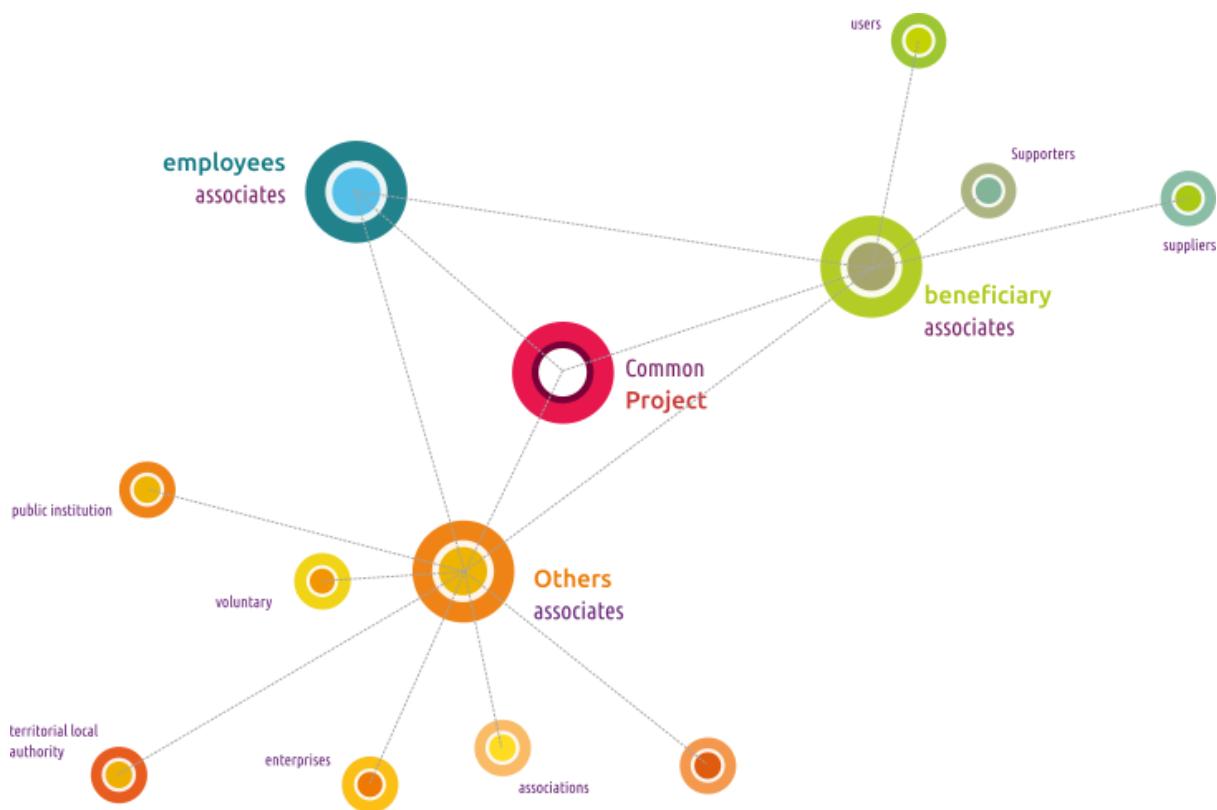
However Blockchain technology is a technology perfectly adapted to managing the exchange of private data. Civis blockchain works, in particular, on the **design a technical architecture** for the blockchain which integrates security and respect for privacy.

Here are some examples of solutions provided by the group of experts :

- **Clear consent:** through the implementation of standard mechanisms for explicit notification and validation of use of personal data in transactions within smart contracts.
- **Privacy by design:** mechanisms which require private signature keys and timestamps will assure security and confidentiality of the data.
- **The right to erase:** storage of encrypted data in an external database done through a key generated by the transaction (this key will itself be saved in the blockchain) This guarantees that access to the data is only possible by the user concerned or with his consent, while allowing the possibility of erasing the data.
- **Limited data retention:** the same mechanism will erase the data beyond a certain timeframe. Only information related to the transaction of the data between two entities is preserved.

These elements will be detailed later in a technical document concerning the compliance of the Smart City's permissioned blockchain network GDPR ("Yellow Paper").

### 3. Collective Interest Cooperative Company (SCIC)



#### 3.1. What is a SCIC?

A SCIC or Cooperative Society of Collective Interest, is a cooperative based on participation, that takes the form of a public limited company or a non-profit SARL. **Its purpose is "the production or supply of public goods and services which are of a social usefulness".**

The functioning of these entities is very similar to that of more traditional cooperatives (SCOP in French): the management is democratic ("one person = one voice") and the mode of operation does not privilege profitability. The company belongs to the employees, but not only to them. The originality of SCICs comes from the fact that capital can also be held by people who benefit from the activity (customers, users, suppliers) as well as by a third category of shareholders made up of local authorities, volunteers, funders, etc.

Finally, none of these stakeholders can have a majority, which inherently means that power is shared out.

## 3.2. The need for a cooperative governance in the Smart City

### Transparency and cooperation

Transparency in the production and use of data produced in the Smart City is a major issue. The use of personal data, contextual data or usage data will only be accepted by citizens if they can control its use and if they are assured that the system in place **leur inherently respects their privacy**. This control requires a total transparency and a real desire for cooperation on the part of the stakeholders: metropolises, private actors managing sensors, etc ...



This transparency and this cooperation naturally lead to two phenomena:

- **the creation of services** which use only the data which is strictly necessary in order for these services to function
- each actor will receive an **explicit and informative demand** for all uses of data concerning them, and at any moment they have the possibility to deny access. This way of operating is now required by new regulation on the management of personal data.

### Inclusive governance



The use of a cooperative structure which is responsible for the governance of the Smart City's data exchange system provides a framework for transparency. But the creation of a legal structure provides another advantage. The aim is to find an open legal format that allows the development of a value-creating ecosystem.

The SCIC structure fulfills this role particularly well, **since it allows both public and private actors and associative structures** to be integrated into the governance of the company.

In this case public actors are mainly services provided by the city, metropolis, administrative division, region, who have data that they wish to make use of. However, research centers, universities and other public institutions involved in data processing for study or research purposes can also find their place in this Cooperative

structure.

Private actors can also participate in several ways.

- As suppliers who can propose development or infrastructure services on the blockchain network

- As data producers who want to submit data co-produced by users under an inclusive governance structure which secures their operations
- As customers who propose new applications or services that make use of data distributed by the platform.

Citizen cooperation in the governance of the smart-city is about both security and democracy.

- **Security**, as it should allow citizens or organisations in charge of defending their interests, to warn of illegal uses
- **Democracy** as it integrates the citizen's vote when making decisions about the evolution of the city in which he lives

The use of a SCIC legal structure in a Smart-City project is all the more relevant since it is perfectly complementary with the use of a permissioned blockchain.

### **Creating a democratic trusted third party**

The permissioned blockchain allows data exchanges to be structured by standardizing formats, securing them using the chaining principle, and to create transparency by making the format of executed contracts public.

**The SCIC structure brings two key solutions** to the smart city through the use of permissioned blockchains:a shared and responsible governance.

### **Shared governance**

SCIC governance **incorporates voting colleges** that allow the interests of different stakeholders to be equitably represented. It is thus possible to submit a decision to the SCIC and to conduct debates within the different colleges. The use of unanimous validation (1 voting college = 1 vote) of judiciously constituted colleges (public, private and citizens) could thus provide a democratic way of guaranteeing the availability, the use and the feasibility of sharing Smart City data .

When it comes to validation, this could be done at a lower cost, by representative actors from the various colleges, by using a consensus protocol like "Practical Byzantine Fault Tolerance" (PBFT) that is **reliable and uses little energy**. They could therefore make their local infrastructure available for hosting validation nodes and guarantee that the validation of transactions can be trusted.

### **Responsible governance**

The major challenge of this governance is to allow for **the free circulation of data**, including personal data, within the Smart City. It must therefore ensure compliance with rules designed to protect individuals such as rules concerning the processing of personal data

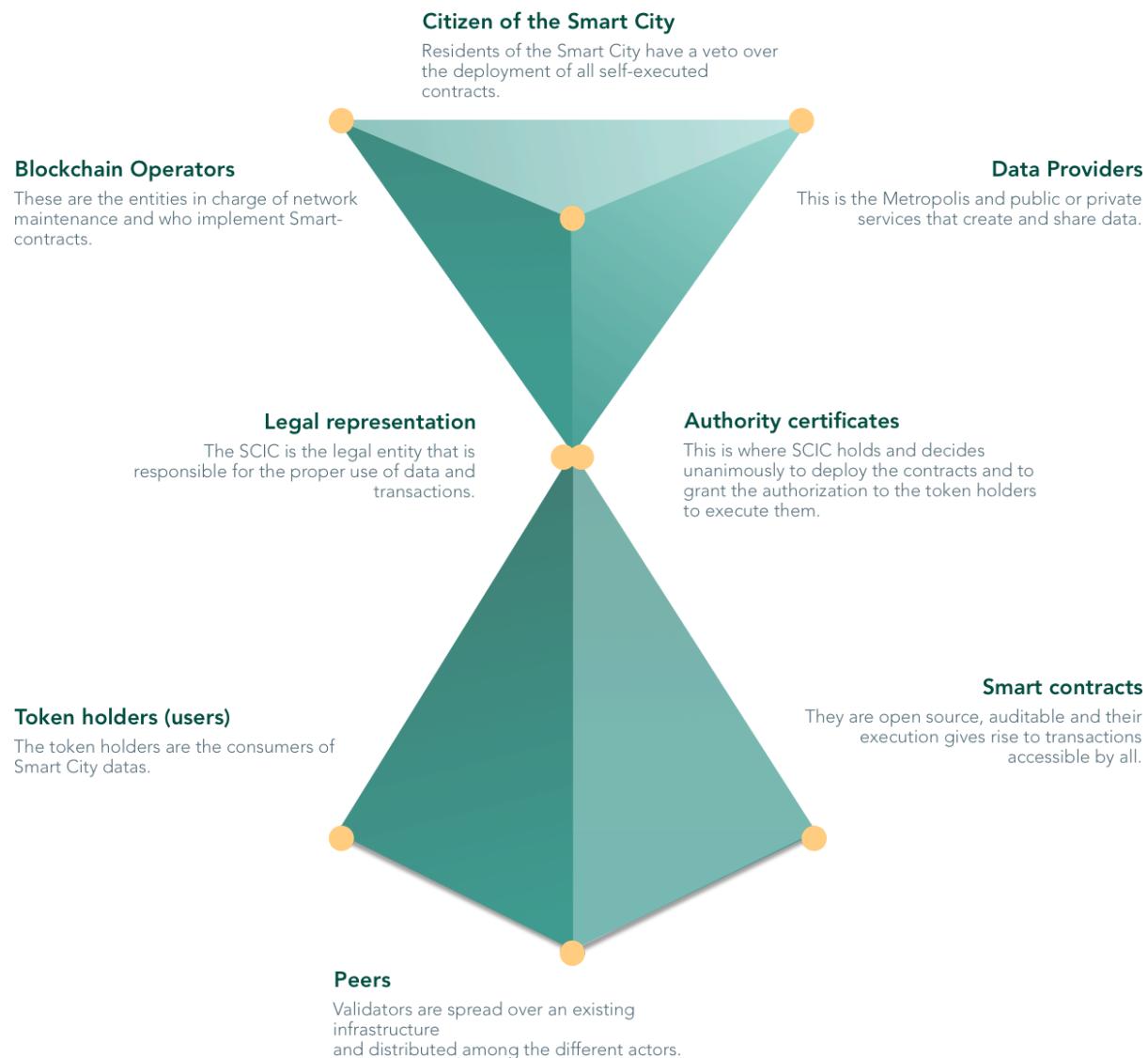
and rules on the free movement of such data. To do this, stakeholders will designate a Data Protection Officer with the authority and skills to carry out this mission. In particular, they will carry out a data protection impact analysis (DPIA) prior to putting the smart city network into place.

In addition, in the context of a Smart City, it is necessary to have a legal person for the **establishment of contractual and commercial relations**. As each stakeholder is themselves a legal entity, there is a need for a clearly identifiable interlocutor who will help to bring about trust and a relation in the long-term. It is thus necessary to have a legal entity who represents the blockchain in order to allow the formalisation and the legal validity of the contractualisation (even automatic) between different stakeholders.

Another aspect of moral responsibility is authority. The development of an ecosystem based on data exploitation requires the creation and validation of (self-executing) contracts between the entity in charge of blockchain administration and data users. These contracts are established in relation to data use. **The existence of a legal person guarantees that the legal representative is capable of denouncing discrepancies.** It also guarantees that the measures for dealing with cases of poor performance by third parties will be carried out.

## 4. Blockchain governance model with a SCIC

A SCIC is the legal structure which most resembles a blockchain due to its decentralised governance and its voting system based on colleges.



It is not always necessary for the governance role (associates) and the operational role to be linked within the SCIC. However the model which is proposed in this white paper proposes a symmetric definition between these two aspects for two reasons:

1. **Simplicity**. In order to make the system simple to use and get a grip on, associates will have the same impact on the governance of the SCIC as on the governance of the network.
2. **Inclusion**. All members of the smart-city should be able to take part in the management of the data. As well as this technically-speaking each inhabitant will have his own data portfolio and will thus be a member of the SCIC.

Associates are thus grouped into voting colleges, in accordance with their (divergent) interests in the blockchain network. There will thus be a minimum of at least three colleges: service providers, data providers, and users. At least one actor per college will take part in validating transactions.

### **Examples of actors who could potentially be associates**

- **Institutional actors** : towns, equipment companies, development companies, the State, state-controlled entities of an industrial or commercial nature, or public sector financial institutions.
- **Operational actors** :
  - entities in charge of the management and development of the network. These could be network operators, IoT providers, smart-contract development providers, standardization bodies.
  - service operators, asset managers, energy producers/managers/distributors, companies and laboratories that develop urban solutions in the form of blockchain applications
- Actors who represent **citizen interests** :
  - Citizen association
  - Research and innovation actors
  - Competitive clusters
  - Clusters.
- **Economic actors** who use data for the purpose of optimisation or for developing services for citizens; users and consumers

Governance decisions or decisions concerning the blockchain network will be made through unanimous consent amongst the colleges of actors. Within each college the decision can be made by majority vote.

From a purely governance point of view, the appointment of the president and the statutes will thus be voted by this governance structure. Likewise, the budget which consists of **funds**



invested by shareholders or income generated by the commissions levied on market transactions within the network, will also be voted by the colleges of associates.

From the point of view of the governance of the blockchain network, the authority certificates will be administered by the SCIC. Management decisions will be made by **an independent decentralised entity which shares the same governance as the SCIC**. In particular, this entity will be responsible for making decisions regarding:

- the evolution in the number of validators and their distribution
- the carrying out and function of self-executed contracts on the blockchain network. The contracts will be open-source and recorded. They will be linked with a legal contract and thus will have legal validity. Each party will thus be able to audit contracts to ensure that the intention and the implementation are aligned.
- the maintenance and development of the network by suppliers. In particular, the establishment or renewal of contracts will also be voted on by members.

The addition of associates will either be systematic if the person is resident in the smart-city, or in the case of legal persons, it will be voted on.

## 5. Civis Blockchain

### 5.1. The role of Civis blockchain

The aim of the SCIC of the smart city will be the administration of the blockchain network and transactions. Through decentralised governance the SCIC will ensure economic cooperation between the actors who are involved in the production, management and use of data.

In order to do this, Civis Blockchain suggests that the process should be carried out progressively with low investment. **The aim of the civis-blockchain association is to create a SCIC as soon as possible, which will bring together all actors as well as to ensure the project management of the design of the blockchain network and its governance.**

To do this, we propose Civis Blockchain's intervention to be based around 3 axes:

- **Education of stakeholders** concerning blockchain technology.
- Proposing different **implementation models for the governance and standardisation** of the blockchain network, in accordance with the GDPR
- The organisation of a **public and transparent communication** concerning actions which have been taken
- The elaboration and the implementation of **international standards** to ensure the durability of platforms

Civis blockchain's implication in the creation phase of the SCIC will end as soon as the first case of active use has occurred. Civis Blockchain will then retain a simple advisory role. The

association does not intend to intervene in the governance of the Smart City. It will not be part of any of the colleges.

## 5.2. Measures put into place

Civis blockchain will put in place the necessary means to coordinate discussion between different actors in order to obtain consensus and arrive at a decision on different subjects.

### Support concerning the legal structure

The Civis Blockchain includes lawyers who are specialised in personal data rights and experts in Blockchain technologies. They work together to make actors aware of legal choices and to validate these, as well as to integrate initiatives and good practices from other projects. In the Civis Blockchain team there are researchers in law, lawyers and members of the OPENLAW association.

### Guarantee security and transparency

General privacy questions concerning personal data will be central to the design, governance and the network of the SCIC. In particular, the traceability of transactions, transparency in the drafting and implementation of contracts, will be discussed with the representatives, charged with managing personal data, from each of the colleges who are interested in participating in the creation of the SCIC.

### A pool of local blockchain experts

The organization of technical discussions which aim to structure data exchange within the blockchain can only be done by carrying out a discussion between all data providers and technical experts. The challenge is to consider:

- ways of making data available and making use of it
- methods for designing and validating contracts issued by the governance body
- conditions of access to, and use of data
- impact analysis concerning data use

### Public communication

Throughout the project's progress, transparent public communication will be carried out. This communication is a means of keeping everyone informed of the progress of the project and the decisions taken. This regular communication also aims to avoid the "tunnel effect" and the "announcement effect".

## 5.3.The Civis blockchain team

Civis blockchain is an association made up of volunteers who wish to participate in the development and implementation of the Smart-City.

### Board members



Nicolas  
Merle



Aurélie  
Bayle



Sajida  
Zouarhi

### Active members

Antoine Chavert

Aurélie Bayle

Eric Thomas

Filipe Vilas-Boas

Frederic Combe

Géraldine MAUDUIT

Jeremie François

Julien Delcroix

Julien Leconte

Klara Sok

Luc Yriarte

Magalie Merle

Marion LOISEAU

Mathieu Pesin

Mickael Ollier

Myriam Criquet

Nicolas Gruet

Nicolas Hersorg

Olivier Carmona

Pascal Arnoux

Rheims Cyril

Sajida Zouarhi

Sebastien Griffon

Simon de Charentenay

Thibault Chazal

Thomas

Zinedine

Zokama Sakanga

## 6 Examples of different types of use

### #Case 1 : Road network maintenance

#### Automation of the collection process, decision support and security

An example of the use of data from the smart city is using data from smart vehicles to maintain the road and prevent accidents.

In this scenario, company and administrative body vehicles or other users of the smart city who use connected vehicles (or vehicles which have a telematic box), send data from motion sensors in order to identify road deformations. Technical services could then have a real-time map of zones which need work. If this is coupled with data



on accidents, it will allow the zones which need priority attention to be identified.

The implementation of this scenario would require the (private) data providers to join the smart-city in order to make their data available. In Montpellier, projects with IoT and connected vehicles are already in progress and could make this experiment possible very quickly.

### **Advantages of the blockchain**

#### **Control over and trust in the use of data**

Under this scenario the contribution of the blockchain is to make it possible to have total traceability of the information and therefore complete confidence in the data which has been provided. The self-executing contract on the city blockchain will determine the conditions of access and which data is accessible to road service providers.

#### **Respect of private life**

On the other hand, the use of self-executing open source contracts ensures that only the data necessary for the operation of the service will be used. What's more the very structure of the blockchain will require the service to obtain an explicit and revocable authorization from each user in order to communicate his personal data and to approve its intended use.

## **#Case 2 : Proof of residency**

### **A more thrifty and responsible use of data leading to new economic models**

Another example is the use of the smart city blockchain to prove a user's residency to a third party.

In order to have access to certain services, for example to open a bank account, it is necessary to provide a proof of address. It can be a phone bill, a bill of water or electricity. The use of these documents proving the home address of the user therefore requires private and irrelevant information (such as the amount of the invoice, the contract number, etc ...) to be communicated to a third party.

Use of the blockchain in this case would allow the third party to simply make a request with the user's public identifier



(linked with water, telephone or electricity services) to validate that he indeed lives at the indicated address.

This request would then go through a self-executing contract, approved by the smart-city, which will authorize a service provider (eg the bank) to obtain the residency data from a third party authority (water supplier, telephone or electricity). However, to be able to make this request, the third party will necessarily have to access the personal data of his client for this specific use and thus will first have to ask him for authorization to communicate the information.

## Advantages of the blockchain

### Control over and trust in the use of data

In this usage, the use of the blockchain is central since it guarantees trust between all the actors, since the information written on the blockchain is by nature unalterable. As well as this there is complete control of the information since there is only access to the information concerning proof of domiciliation and not all data associated with the contract.

### Respect of privacy

Another important element illustrated by this case is respect for private life. At each stage users will be required to give their approval for third parties to access their data, and precisions on the use of the data will be systematically provided. The open-source implementation of a self-executing contract on a blockchain whose governance includes the participation of citizens is an additional guarantee since it can, at any time, verify that the advertised use is indeed the use which is implemented under the contract.

### New models

Data exchange carried out through the blockchain brings about new models for getting more value from data. The transition from a storage economy to an access economy allows for new business models. In this particular case, the entity which provides proof of residency could monetize its service with the bank. This service is valuable as it reduces processing costs and speeds up the sales process. The SCIC could receive a commission on this financial value exchange, as this process has been made possible due to the SCIC's infrastructure. The generated revenue could be used to maintain infrastructure and possibly to auto-finance other projects of public interest.

## #Case 3 : Accelerate eco-citizen involvement

**Citizen blockchain applications to better assess our impacts, steer our policies, value commitment and encourage action.**

The deployment of a blockchain infrastructure within cities and metropolises can also become a solution for achieving the 17 Sustainable Development Goals, which have been promoted by the United Nations since 2016.

Indeed, the use of the blockchain makes it possible to accelerate and to improve in an transparency and stakeholder collaboration around projects with positive societal impacts in an unprecedented manner. Initiatives using blockchain technologies are already in place. They make it easier to involve citizens, traders, and employees in the sustainable development of the city by valuing their commitments and encouraging them to act.

The implementation of such initiatives in Smart Cities would be extremely simplified by simply installing existing decentralized applications on the network.

**An example of the use of a citizen blockchain application within the Smart City network.**

The application which has been developed by the PlayitOpen company based in Montpellier is a good example of a citizen application which could be used directly on the city network.

The application developed by PlayitOpen allows the participant to be credited with a given amount of an "eco-citizen token", a kind of eco-positive local currency, when they carry out certain actions:

- An employee who chooses to go to work by bike to work and thus avoids CO2 emissions could earn 1 token / km,
- A company which reduces water use could earn 3 tokens / litre
- A citizen who purchases sustainable peri-urban agricultural products could earn 1 token per euro spent.

These events could be captured in the Smart City (RFID chips on bikes, connected water meters, QRCode on products), registered and certified on the blockchain, and credit players with the amount of tokens in a digital wallet.

This token could then be converted very simply into goods and services provided by partner companies involved in the project (occasional rental of vehicles, city services, local business' bargains) by using a smartphone or a printed coupon.

Partner companies could use this service as a means of effective and targeted communication and publicity according to the types of initiatives they support. They would

also be able to improve their image through quantitatively evaluating their commitment by using a dashboard which records their contribution to the sustainable development of the city.

This example means a metropole would have an effective method to encourage sustainable development and increase innovation, as well as a unique tool for directing and supervising its socially responsible policies.

The application can be adapted to accelerate the development of all types of socially positive businesses for the territory: energy savings, recycling and waste management, eco-friendly transport, local food, inclusion and solidarity.

### **Advantages of the blockchain**

#### **Control over and trust in the use of data**

Quantified, authenticated and structured data is collected automatically, for effective and tangible accounting of the impacts of eco-citizen behavior.

#### **Respect of privacy**

Through the blockchain, the application only accesses the personal data which is strictly necessary for its operation, and with the permission of its owners.

#### **New models**

By allowing companies in the social and solidarity economy and the impact economy to connect directly with their stakeholders, the Smart City blockchain network multiplies their capacity for action which is in the collective interest, and their potential to create economic activity and sustainable and non-relocatable jobs in their regions.

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Do you want to know more or be involved?

Join Civis blockchain and help us develop ideas on how to use the blockchain in the Smart City and tools to simplify its use.

<http://civis-blockchain.org>