

Artificial Intelligence and Blockchain Summit

Virginia Cram-Martos
Berlin, 19 November 2019



Our Agenda



- 1. What is a Blockchain and Why Should Governments Care?**
- 2. Governments Using Blockchain**
- 3. Critical Factors and Resources**

1. What is Blockchain and Why Should Governments Care?





= Just One Blockchain Out of Many

Blockchain

= A Distributed Ledger Technology (DLT)

= The principal, most tested DLT

An example of another DLT is the IOTA Tangle

Not all Blockchains and DLTs are equal, they vary in:

- **Vulnerability** (to hacking and other system failures)
- **Robustness** (how well they handle problems such as flawed code or being hacked)
- **Cost** (transaction cost, sometimes referred to as «gas»)
- **Speed and ability to scale up** (to large transaction volumes)
- **Degree of Privacy** (pseudo anonymity vs total anonymity)

What are the Benefits?

Blockchain has the potential to significantly improve asset and information management through

- **Immutable and verifiable transactions and time “stamps”** allowing the elimination of paper where today it is still required;
- **Automated (and immediate) reconciliation** algorithms facilitating faster payments and improving accountability
- **The tracing of digital assets through 100s or 1000s of transactions** supporting the tracking of goods, for example because they are sensitive/regulated or to ensure the sustainability of their origin (for example, to prove that wood comes from a sustainably managed forest)
- **Immutable “original” information which can be used for identities, reputations, electronic certificates, licenses, etc.** facilitating access to benefits, reducing fraud and speeding up regulatory procedures.

Blockchain Technology will profoundly change government business models

Through

- 1. The creation of “original” electronic documents**
- 2. Instant reconciliation**
- 3. Instant traceability**
- 4. Increased transparency**



Creation of “Original” Electronic Documents

Blockchain can be used to create

- **Electronically “notarized” original electronic documents or agreements such as contracts, certificates, diplomas and licenses**
- **Including a time stamp and a “guarantee” that no changes have been made since the time of issuance**





To illustrate this capacity, take the Bitcoin (or any cryptocurrency) application

For each individual crypto-coin, its blockchain automatically tracks every transaction, including the date, and time and the participants – that is how the blockchain knows who owns a crypto-coin at any moment in time.

In Bitcoin, transaction participants are pseudonymous (act using a pseudonym that provides anonymity as long as the owner of the pseudonym is not revealed). But a Blockchain network can also be designed so that every participant is known.

Now, take the crypto-coin and replace it

with the “digital twin” (digital representation) of a document, such as a property deed, or a publicly procured good, such as an office computer

Imagine the possibility for tracing every transaction involving that document or good and, if relevant, knowing the identity of the participants

“Instant” Reconciliation



The traceability function of blockchains results in the network knowing the exact balance of crypto-coins owned by every node/participant.

In other words, this property can be used to automatically create audit trails, even for complex, multi-party, multi-location transactions which are spread out over time.

Now Imagine this capacity being used to track:

- **Pension benefits**
- **Automobile ownership**
- **Budget expenditures (by projects, departments, agencies, etc)**

Most non-currency Blockchain applications use Smart Contracts

Smart Contracts are computer programmes stored on a blockchain (so they cannot be changed) which automatically execute based on defined «events». These events are notified to the blockchain by trusted «oracles» which could be government agencies, or sensors or other reliable data sources

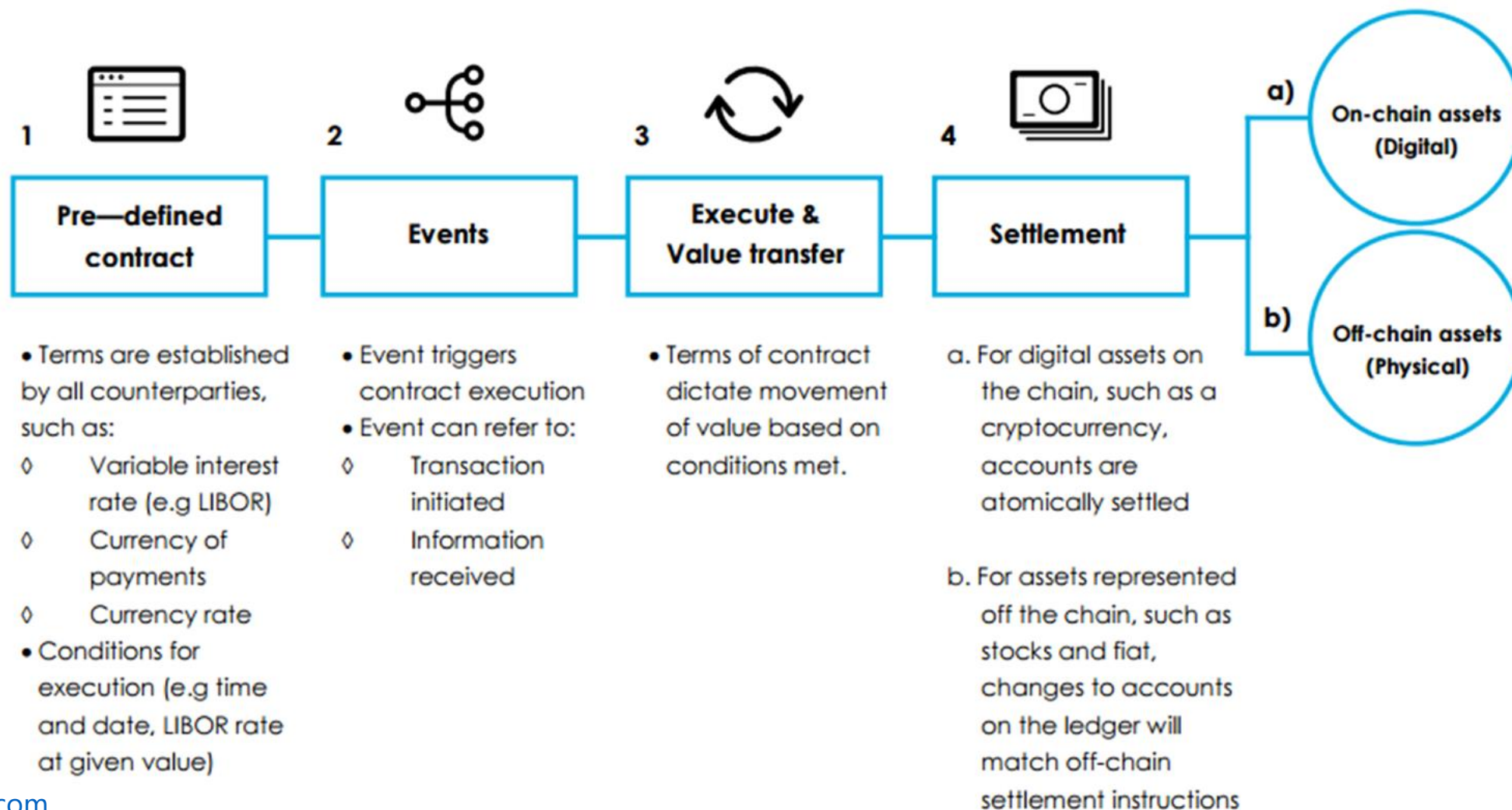
For example, if a sensor inside a container indicates that its temperature has exceeded a permitted level, a smart contract could send a request for an inspection or trigger an insurance payment.

Note: if you are designing an application, select your oracles carefully because they can be a serious «weak point»

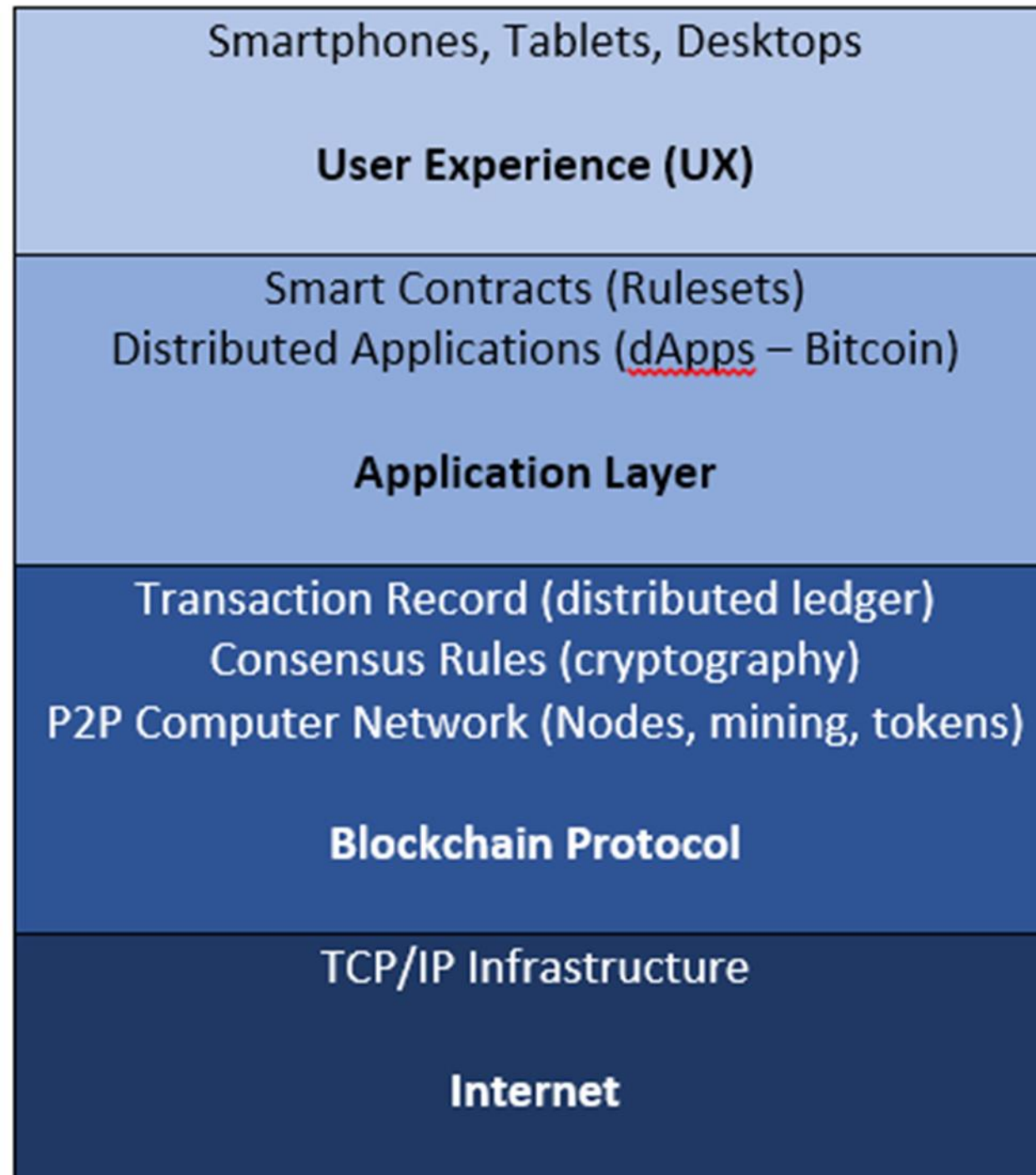
Smart Contracts were invented in the 1990s by Nick Szabo; the proposal to programme a blockchain for implementing them was made by Vitalik Buterin in late 2013 who co-founded Ethereum which went live in July 2015.



Smart Contracts are programmes on a blockchain that automatically execute based on defined «events»

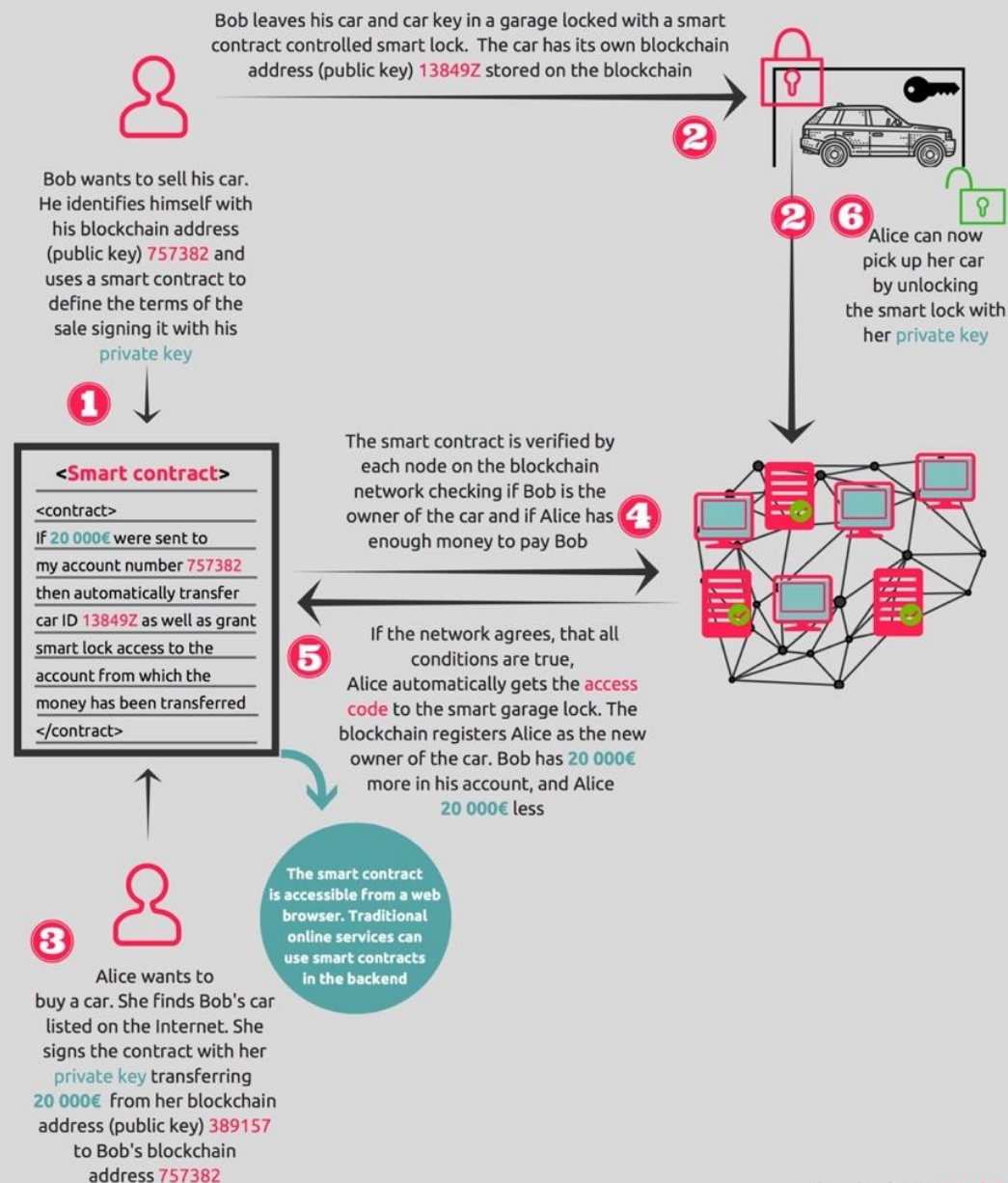


How do smart contracts fit into the overall blockchain context?

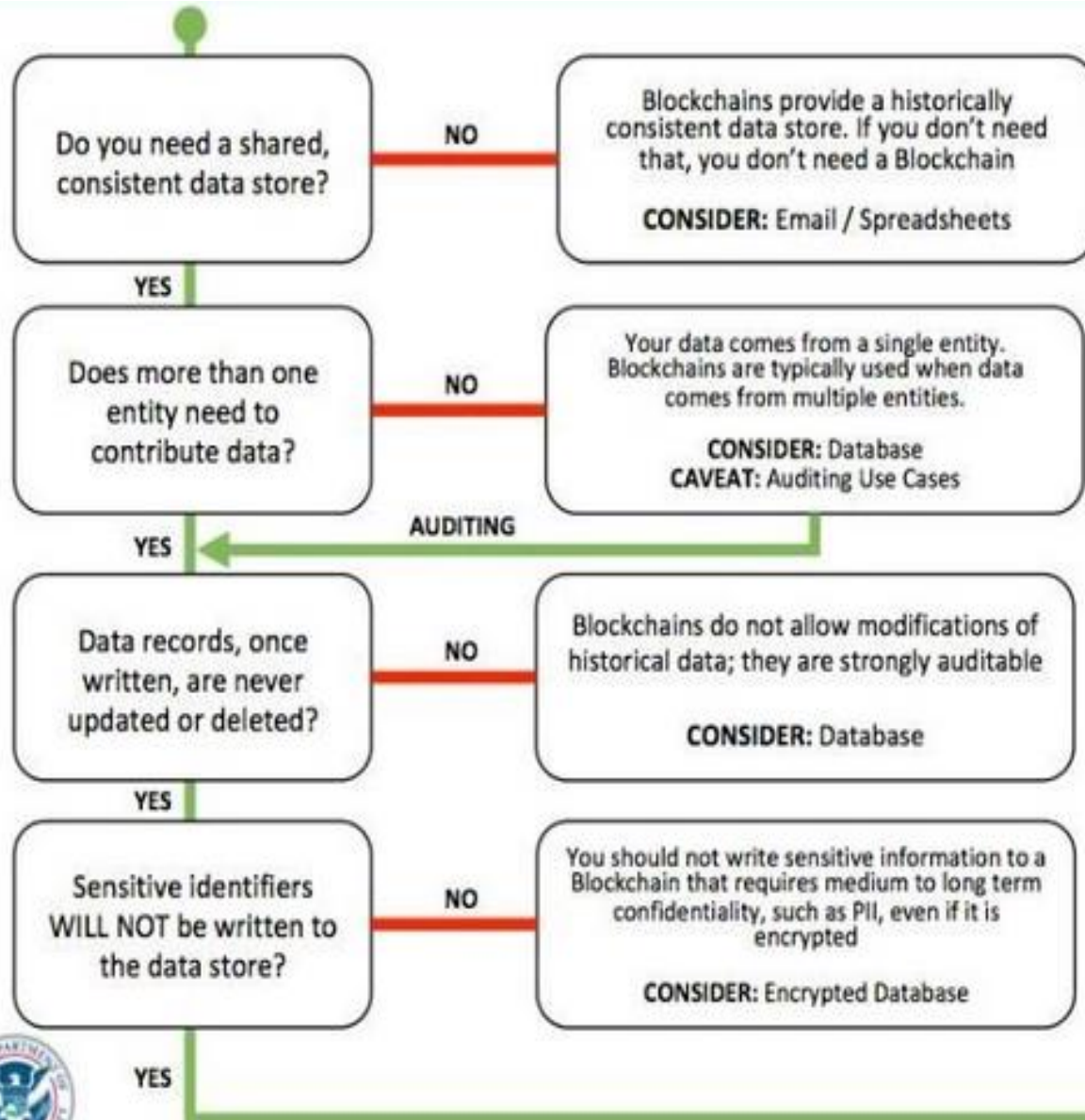


Most security
flaws in
blockchain
systems occur
in these top
two layers and,
especially, in
UX

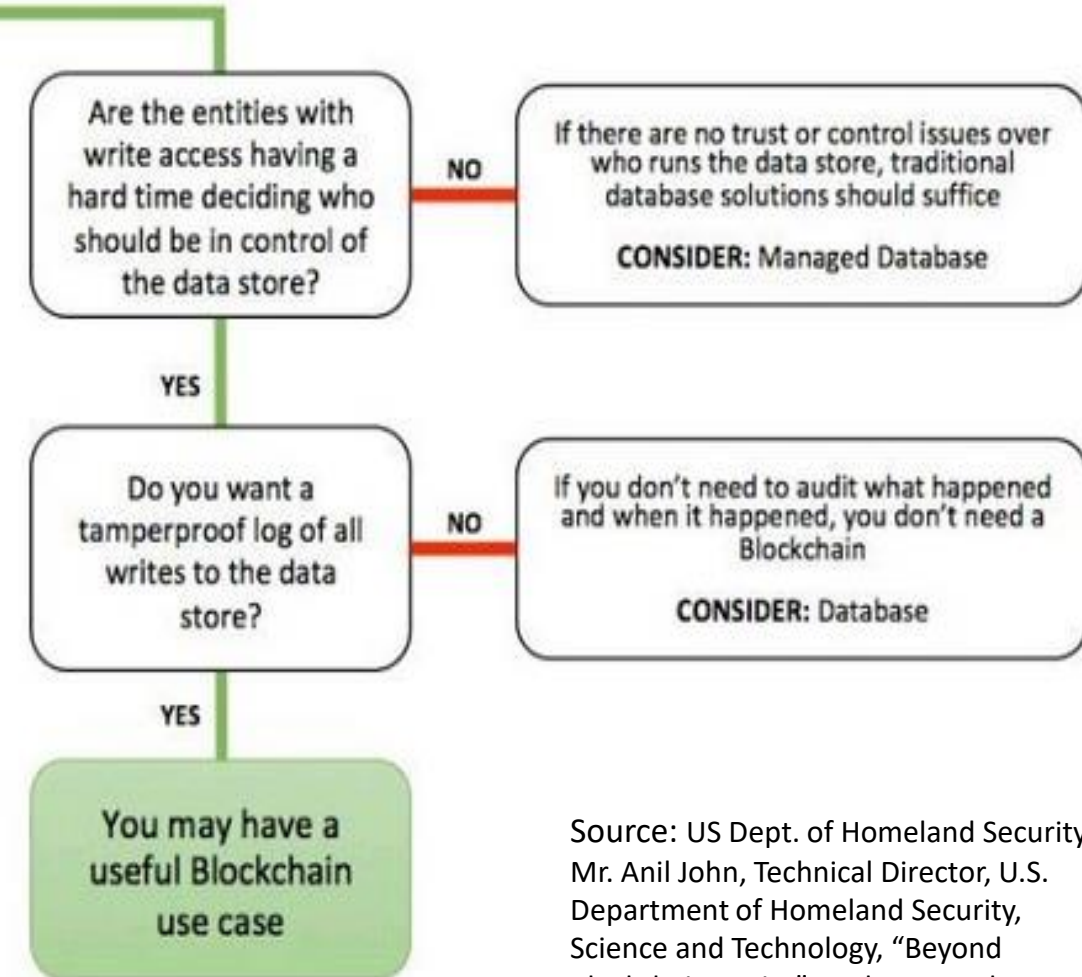
A smart contract example: purchasing a car



Is Blockchain the «Right» Solution?



If only one of the answers on the right is «no», you may still have a case. For example, if a tamper-proof log is key or those with read access do not trust those with write access



Source: US Dept. of Homeland Security, Mr. Anil John, Technical Director, U.S. Department of Homeland Security, Science and Technology, "Beyond Blockchain Basics", at the Annual Computer Security Applications Conference, 5 December 2018



**The original presentation by METI and the full report it is
based upon can be found at:**

http://www.meti.go.jp/english/press/2017/0329_004.html

Text that is in italics and underlined was added or changed

Evaluation Forms for Blockchain- Based System ver. 1.0

12 April 2017

**Information Economy Division
Commerce and Information Policy Bureau**

There are many Blockchains and many variations in blockchain technology

Typical classification of blockchain platform by governance scheme (this information changes regularly based on new research and technical developments)

*Modified from IBM release document

	Public	Consortiums	Large Corporates
Governance	<i>System Protocol</i>	Several parties	One single party
Identity of users	Open - Free	Permissioned (for write access or both write and read access)	
	Not specified, may contain malicious members	<i>Specified, composed of "reliable" members (who, nonetheless, if «hacked» could become malicious)</i>	
Consensus algorithm	Proof of Work, of Stake, etc.	<u>Proof of Stake</u> , PBFT (Practical Byzantine Fault Tolerant) <u>or other</u>	
	Slower-block confirmation Large electricity consumption	Fast block confirmation, Small electricity consumption	
Processing time of transaction	<u>Currently</u> Long (e.g. 10 min)	Short (e.g. a few seconds)	
Use case	Virtual currency, <u>Notarized documents, tokenized assets etc.</u>	Business network as interbank transfer, stock exchange etc.	
Example	Bitcoin, Ethereum etc.	Ripple, Hyperledger Fabric, etc.	

Items on Evaluation Forms for Blockchain-Based Systems ver. 1.0 (METI)

Large Category	Category	Evaluation items	Large Category	Category	Evaluation items	Large Category	Category	Evaluation items
Quality	Performance Efficiency	Throughput	Maintenance / Operation	Maintainability & operability	Modularity	Cost	R&D	R&D of Blockchain platform technical elements
		Network latency			Reusability			R&D of subsystems
		Block confirmation			Analyzability			Hardware cost
		Data reference			Modifiability			Software cost
	Interoperability	Interoperability with existing systems					Implementation (Commercialization)	System implementation cost
		Interoperability with other blockchain systems	Operational cost					
	Scalability	Throughput	Maintenance & operation	Maintenance cost				
		Network latency						
		Capacity						
	Scalability	Number of nodes						
	Reliability	Maturity						
		Availability						
	Reliability	Fault Tolerance						
		Recoverability						
	Security	Confidentiality						
		Integrity						
		Non-repudiation						
	Security	Authenticity, <i>Able to be authenticated</i>						
	Portability	Adaptability						
		Replaceability						

These Items Are Closely Related To The Characteristics Of Blockchain Technology

These Items Are Closely Related To The Characteristics Of Blockchain Technology

EXAMPLE - Evaluation Forms

DESCRIPTION ver. 1.0 (METI)

* BC= blockchain

Category	Evaluation item	Outline of category	Related BC technology & BC characteristics	Points to remember and remarks on using Evaluation form
Reliability	Fault Tolerance	Degree to which a system, product or component operates as intended despite the presence of hardware or software faults.	• Node failure tolerance • Tolerance of network failure and network attacks	• Clarify the definition of normal operation. • Clarify node conditions and network conditions for normal operation. • Clarify the main chain determination method after fork generation due to network divisions.
	Recoverability	Degree to which, in the event of an interruption or a failure, a product or system can recover the data directly affected and re-establish the desired state of the system.	• Recoverability of node failure (recovery method and time, etc.)	• Clarify preconditions for the network environment and data volume.
Security	Confidentiality	Degree to which a product or system ensures that data are accessible only to those authorized to have access.	• Access control	• Clarify the management method of the access authority (reading, writing, etc.) to the data, setting level, etc.
			• Data anonymization	• Clarify the existence of a function to conceal data. • Clarify the object and scope of concealment. • Clarify concealed data verification method by third party.
			• Transaction anonymization	• Clarify the existence of a function to conceal transactions. • Clarify the object and scope of concealment. • Clarify the verification method by third party.
	Integrity	Degree to which a system, product or component prevents unauthorized access to, or modification of, computer programs or data.	• Membership management	• Clarify the existence of membership management functions.
			• Access control	• Clarify the management method of the access authority (reading, writing, etc.) to the data, setting level, etc.
	Non-repudiation	Degree to which actions or events can be proven to have taken place, so that the events or actions cannot be repudiated later.	• Consensus algorithm	• Clarify the existence of block confirmation by consensus algorithm. Also, clarify how to decide the main chain after fork.
			• Hard fork policy	• Clarify the rule, method, and the extent of the influence of block rollback.

The Evaluation of Blockchain Systems Depends Upon a Complex Set of Trade-offs Between Unique Characteristics

Descriptions of Many Key System Characteristics Can Often be Found in System «White Papers»

Some Additional Resources on “What is Blockchain?”

- <https://www.coindesk.com/>

Introductory information is under «Blockchain 101»

- <https://blockgeeks.com/>

Note: Don't be scared by the very «techy» home page. Under search enter your question, for example «What is a smart contract?»

2. Governments Using Blockchain



Trusted and Authentic Information - Collection

The information needed for delivering government services often comes from a range of sources including:

- Multiple government agencies
- Different levels of government (federal, provincial, municipal)
- Semi-public or private organizations
- Citizens themselves

As a result, governments collect and copy information which is prone to errors and communication problems

Blockchain can be a cost-effective way to create a secure source of shared data to replace multiple, centralized information silos

Trust Must be Earned!

For Blockchain applications

Data quality is extremely important

So a great deal of attention must be given to the process of adding data as well as the establishment of any initial baseline data

Otherwise,

Garbage in, Garbage forever!



Blockchain Data Quality

Remember:

While blockchains may be immutable and very transparent (you can see everything that was written and which “address” outside the blockchain made the change)

The correctness of blockchain data depends upon the quality of the EXTERNAL process(es) which decide what data will be written to the blockchain

In Government Blockchain Applications, **Data Quality is a HUMAN RIGHTS ISSUE**

- Because data in a blockchain may decide what a citizen
- Legally owns
 - The services and benefits they are entitled to
 - The professional activities they can undertake
 - etc



Common Use Cases

- **Identity (persons and legal entities)**
- **Official documents (licenses, diplomas, taxes paid, etc.) issuance and related reconciliations**
- **Property registration (Land Registries, Cadastres)**
- **Government asset monitoring and management**
- **Government financing**
- **Voting and citizen consultations**
- **In some cases: energy grid management**
- **In some cases: healthcare monitoring and management**

The Australian Government and Blockchain

In March 2019 the Australian Government announced a strategy for advancing its **“blockchain industry”**

Among a range of Australian government projects has been

- Investigations by their Digital Transformation Agency on the benefits of using blockchain for government payments and
- Work with the Commonwealth Scientific and Industrial Research Organization (CSIRO) to trial a blockchain-powered application that uses smart contracts to distribute disability insurance payments, reducing the risk of disability insurance fraud and reportedly saving the recipient and/or their caregiver 1 to 15 hours per week in paperwork

<https://www.ethnews.com/australia-unveils-blockchain-project-plans-and-government-funding>

<https://www.minister.industry.gov.au/ministers/karenandrews/media-releases/advancing-australias-blockchain-industry>



Blockchain - Blockchain (en) x +

dutchblockchaincoalition.org/en

Blockchain use cases



Compliance by design

Subsidies are an important tool for ensuring that we organise society in the way that we want. For example, subsidies for green energy, for farmers who produce what we need or for helping people who need help.

[Read more >](#)



Pension

The changing employment market in which Dutch citizens change jobs with increasing speed and frequency, poses considerable administrative challenges for pension schemes that can result in uncertainties for pensioners. Compared to the current systems, several questions, such as 'how much pension have I built up where?', can be made easier to answer using Blockchain technology.

[Read more >](#)



Educational certificates and diplomas

A student who wants to continue his or her studies at a foreign institution faces the challenge of sharing the diploma gained or required and getting this recognised as authentic. This mostly paper-based procedure often leads to much extra work for the student and places a burden on the administration concerned.

[Read more >](#)



Logistics

Blockchain offers many opportunities for logistics chains.



Self-Sovereign Identity (SSI)

A self-sovereign identity (SSI) is the driving force for a supple interaction in the online economy with a direct impact on the physical world. That is only possible with government interactions and therefore participation, especially for the confirmation that you who you claim to be and/or that you are 18+ and many other values.



Vision document

The Dutch Blockchain Coalition originated from a unique collaboration between industry, government and education, also known as the 'triple helix'. This cooperation already yields the first results in practice. This first vision document sets out the concrete results and the action lines for the future.

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Decline Accept

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13:57 17/11/2019

Netherlands Prototypes & Production 1 of 2

Identity-related

- Registration of birth certificates - Tykn (prototype)
- Registration of degrees / certificates (education) - City of Antwerp, Ministry of Interior, Ministry of Education, SIDN Foundation (prototype)

Supply chain and transport

- Transfer of ownership in logistical processes - Port of Rotterdam (prototype)
- Permits for transnational transport - Human environment and transport inspectorate, Ministry of Infrastructure (prototype)

Real estate

- Registration lease contracts - City of Antwerp (prototype)

Healthcare

- Authorisations in healthcare processes - Healthcare Institute (prototype)
- Personal Healthcare budgets - City of Amsterdam (prototype)
- Medical results - Utrecht Medical Center (prototype)

Netherlands Prototypes & Production 2 of 2

Finance

- Subsidies - City of The Hague / City of Schiedam / City of Amsterdam (prototype)
- Debt assistance - City of Schiedam / City of Utrecht (prototypes)
- Securities - City of Haarlem (prototype)
- Settlements within a single organization - Municipality of Drechtsteden (prototype)
- **Child allowances - City of Zuidhorn (In production)**

Other

- Decentralized energy exchange - Amsterdam (prototype)
- Elections - Five municipalities (prototype)



Infrastructure Maintenance – Cities of Alphen and Zoetermeer the Netherlands

Blockchain and IoT project where lamp posts, equipped with sensors and connected to a blockchain, independently send out repair orders and make payments after a repair is completed. This is being implemented - a proof of concept was done in 2017

Benefits:

- 1) Immediate reports of broken street lighting*
- 2) Much shorter time and much less administration for processing repair orders*
- 3) Because maintenance work is offered on an online platform in a transparent way, all qualified companies (including SMEs) that meet certain criteria will be eligible for repair work.*

Peru - Procurement

In May 2019, Perú Compras, the government procurement agency announced that it will put its procurement on a permissioned blockchain.*

For each tender, the platform will function as a smart contract where the tender, the offers and all related operations will be registered in an immutable and verifiable manner. In addition, contract payments will be linked, via smart contract, to events that demonstrate the degree of contract implementation.





PERÚ COMPRAS

ORDEN DE COMPRA
ORDEN_DE_COMPRA-327636-2019



IM-CE-2018-2 ÚTILES DE ESCRITORIO, PAPELES Y CARTONES
| ÚTILES DE ESCRITORIO

<u>DATOS DE LA ENTIDAD</u>	
RUC	: 20601845335
Razón Social	: GOBIERNO REGIONAL DE UCAYALI RED DE SALUD N° 01 CORONEL PORTILLO
Fecha de formalización	: 15/04/2019
<u>DATOS DEL LUGAR DE ENTREGA</u>	
Dirección	: JR. LOS TULIPANES Mz. 1, Lote 5
Ubigeo	: MANANTAY / CORONEL PORTILLO / UCAYALI
Referencia	: POR LA POSTA DE SALUD 7 DE JUNIO
Latitud / Longitud	: /
Código Postal	: 51061
<u>DATOS DEL PROVEEDOR</u>	
RUC	: [REDACTED]
Razón Social	: [REDACTED]
Domicilio Fiscal	: [REDACTED]
Ubigeo	: [REDACTED]
Nota Legal	: [REDACTED]

<u>DATOS DE RESPONSABLES DE RECEPCIÓN</u>	
Responsable	: NICOLAS VELA CASTRO
D.N.I.	: 40946453
Teléfono	: 979449116
Cargo	: JEFE DE LA UNIDAD DE ALMACEN
Correo electrónico	: clausnico80@gmail.com
<u>DATOS PARA EL PAGO DE LA PRESTACIÓN</u>	
Banco	: BBVA CONTINENTAL
Número de Cuenta	: 0233020029553
CCI	: 0112330002002595342
<u>DATOS DE LA CONTRATACIÓN</u>	
Tipo de Compra	: Compra ordinaria
Plazo de entrega	: 3 días calendario
N° expediente SIAF	: 883

* LAC-Chain, launched by the Inter-American Development Bank and the initiative will collaborate with [Stamping.io](https://observatorioblockchain.com/everis-entre-las-empresas-elegidas-por-el-bid-para-combatir-la-corrupcion-en-peru-con-blockchain/), a platform for certifying the traceability of goods <https://observatorioblockchain.com/everis-entre-las-empresas-elegidas-por-el-bid-para-combatir-la-corrupcion-en-peru-con-blockchain/>

3. Critical Factors and Resources



Critical Factors/Hurdles 1

- Ensuring legal recognition of fully digitized contracts, both domestically and internationally
- Designing an effective digital twin (ID) for goods and transactions (i.e. how to represent physical goods on a blockchain network)
- Designing processes so that the “transactions” (events) recorded for digital twins reflect the information needed for decision making



Critical Factors/Hurdles 2

- **Selecting a blockchain network to match an application's needs (security, speed, types of nodes, participation of nodes, etc.)**
- **For smart contracts: identifying decision points, decision criteria and exception handling (the 20% requiring 80% of the effort)**
- **Interoperability between blockchain networks. Citizens and companies today may interact with, at most, one or two blockchains. In 5-10 years they may be interacting with 15 or 20 blockchain networks – so they will need to be able to exchange information**



Critical Factors/Hurdles 3

- **Scaling up, i.e. how to ensure that all participants register transactions and have the ability to do so.**
- **Identifying external data sources and developing consistent and secure data linkages**
- **Ensuring the quality of data, a critical point given the inability to change data entries in blockchain networks**



Critical Factors/Hurdles 4

- Integrating blockchain solutions into legacy systems
- Resolving interoperability problems between multiple software systems using different technologies
- Obtaining a critical mass of users - which may require getting competitors to participate in “competitive cooperation” models



Webmail - Principal x

Inbox (3,198) - crammartos@gmail.com x

Other New Tech resources: Other x

Index - INATBA x

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inatba.org

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INATBA

ORGANIZATIONMEMBERSNEWS & EVENTSBECOME A MEMBERCONTACT US

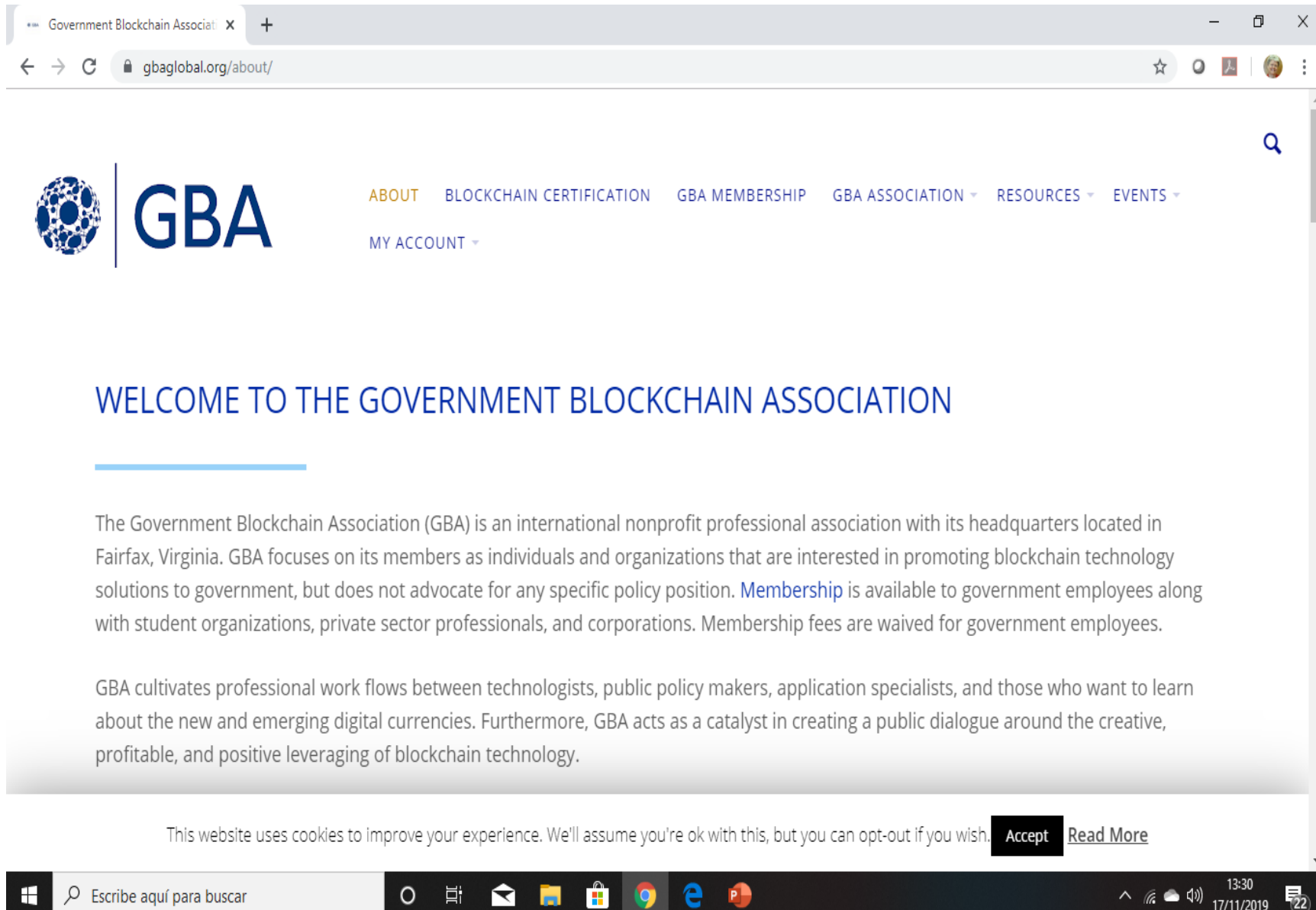
International
Association for Trusted
Blockchain
Applications

INATBA offers developers and users of DLT a global forum to interact with regulators and policy makers and bring blockchain technology to the next stage.

BECOME A MEMBER

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Government Blockchain Association



The screenshot shows a web browser window with the URL `gbaglobal.org/about/`. The page features the GBA logo, a navigation menu with links like 'ABOUT', 'BLOCKCHAIN CERTIFICATION', and 'GBA MEMBERSHIP', and a main heading 'WELCOME TO THE GOVERNMENT BLOCKCHAIN ASSOCIATION'. The text describes GBA as an international nonprofit professional association focused on promoting blockchain technology solutions to government. A cookie notice is visible at the bottom of the page.

Government Blockchain Associat x +

← → ↻ 🔒 gbaglobal.org/about/ ☆ 📄 🌐 🌍 ⋮

 **GBA**

ABOUT BLOCKCHAIN CERTIFICATION GBA MEMBERSHIP GBA ASSOCIATION ▾ RESOURCES ▾ EVENTS ▾

MY ACCOUNT ▾

WELCOME TO THE GOVERNMENT BLOCKCHAIN ASSOCIATION

The Government Blockchain Association (GBA) is an international nonprofit professional association with its headquarters located in Fairfax, Virginia. GBA focuses on its members as individuals and organizations that are interested in promoting blockchain technology solutions to government, but does not advocate for any specific policy position. [Membership](#) is available to government employees along with student organizations, private sector professionals, and corporations. Membership fees are waived for government employees.

GBA cultivates professional work flows between technologists, public policy makers, application specialists, and those who want to learn about the new and emerging digital currencies. Furthermore, GBA acts as a catalyst in creating a public dialogue around the creative, profitable, and positive leveraging of blockchain technology.

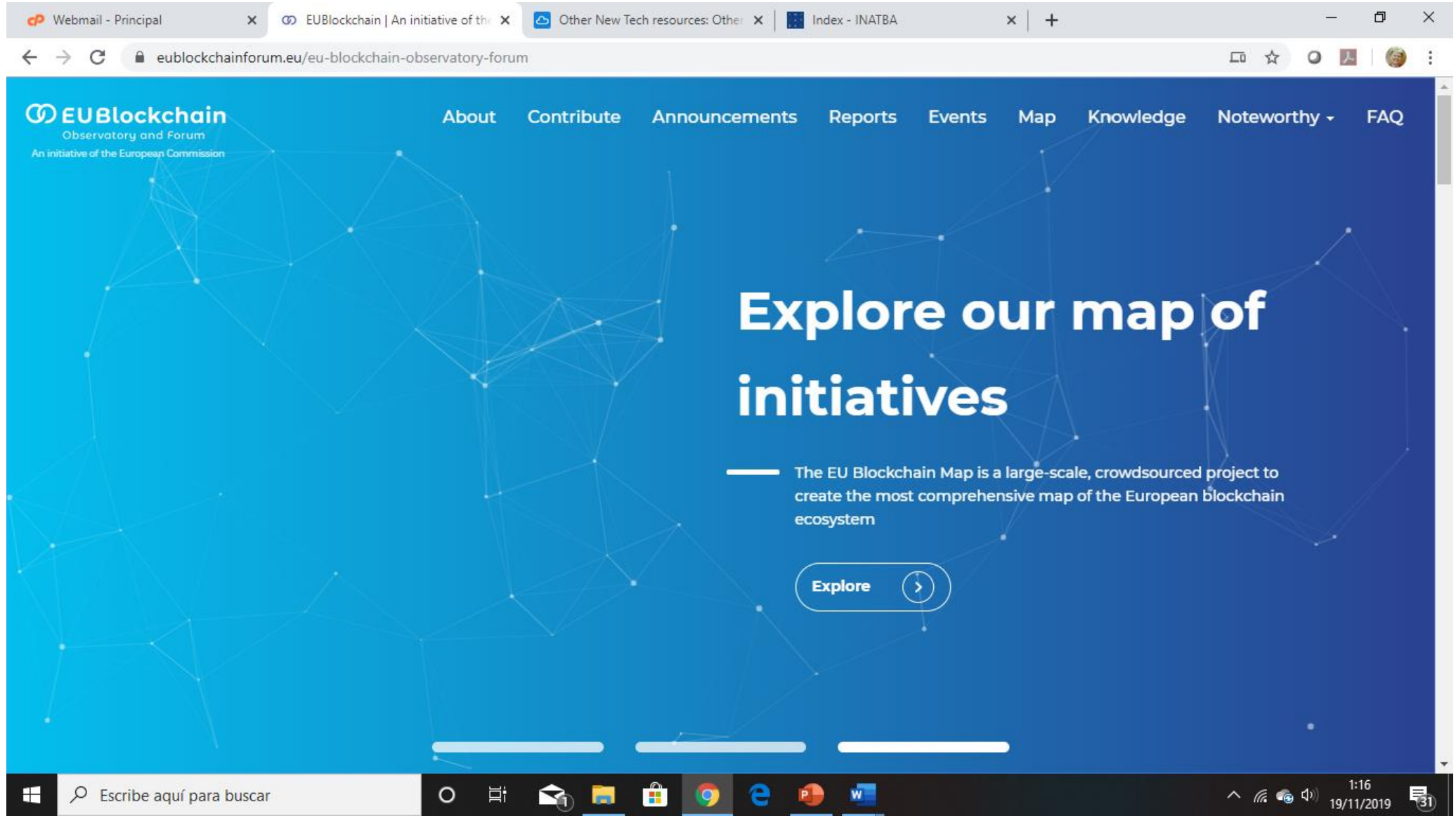
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🔌 📶 🗣️ 13:30 17/11/2019 22

European Blockchain Observatory

<https://www.eublockchainforum.eu/eu-blockchain-observatory-forum>



The screenshot shows a web browser window with multiple tabs. The active tab is titled "EUBlockchain | An initiative of the European Commission". The address bar shows the URL "eublockchainforum.eu/eu-blockchain-observatory-forum". The website has a blue header with the "EUBlockchain" logo and navigation links: "About", "Contribute", "Announcements", "Reports", "Events", "Map", "Knowledge", "Noteworthy", and "FAQ". The main content area features a large blue background with a white network diagram. The headline reads "Explore our map of initiatives". Below this, a paragraph states: "The EU Blockchain Map is a large-scale, crowdsourced project to create the most comprehensive map of the European blockchain ecosystem". A button labeled "Explore" with a right arrow is positioned below the text. The Windows taskbar at the bottom shows the search bar with the text "Escribe aquí para buscar" and various application icons. The system clock in the bottom right corner displays "1:16" and "19/11/2019".

Webmail - Principal x EUBlockchain | An initiative of the European Commission x Other New Tech resources: Other x Index - INATBA x +

← → ↻ eublockchainforum.eu/eu-blockchain-observatory-forum

EUBlockchain
Observatory and Forum
An initiative of the European Commission

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Explore our map of initiatives

— The EU Blockchain Map is a large-scale, crowdsourced project to create the most comprehensive map of the European blockchain ecosystem

Explore >

Windows taskbar: Escribe aquí para buscar | 1:16 | 19/11/2019



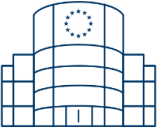
How does it work?

The Member States will operate EBSI nodes at national level. These nodes will be able to create and broadcast transactions that will update the ledger. The architecture of each node will be composed of two main layers:

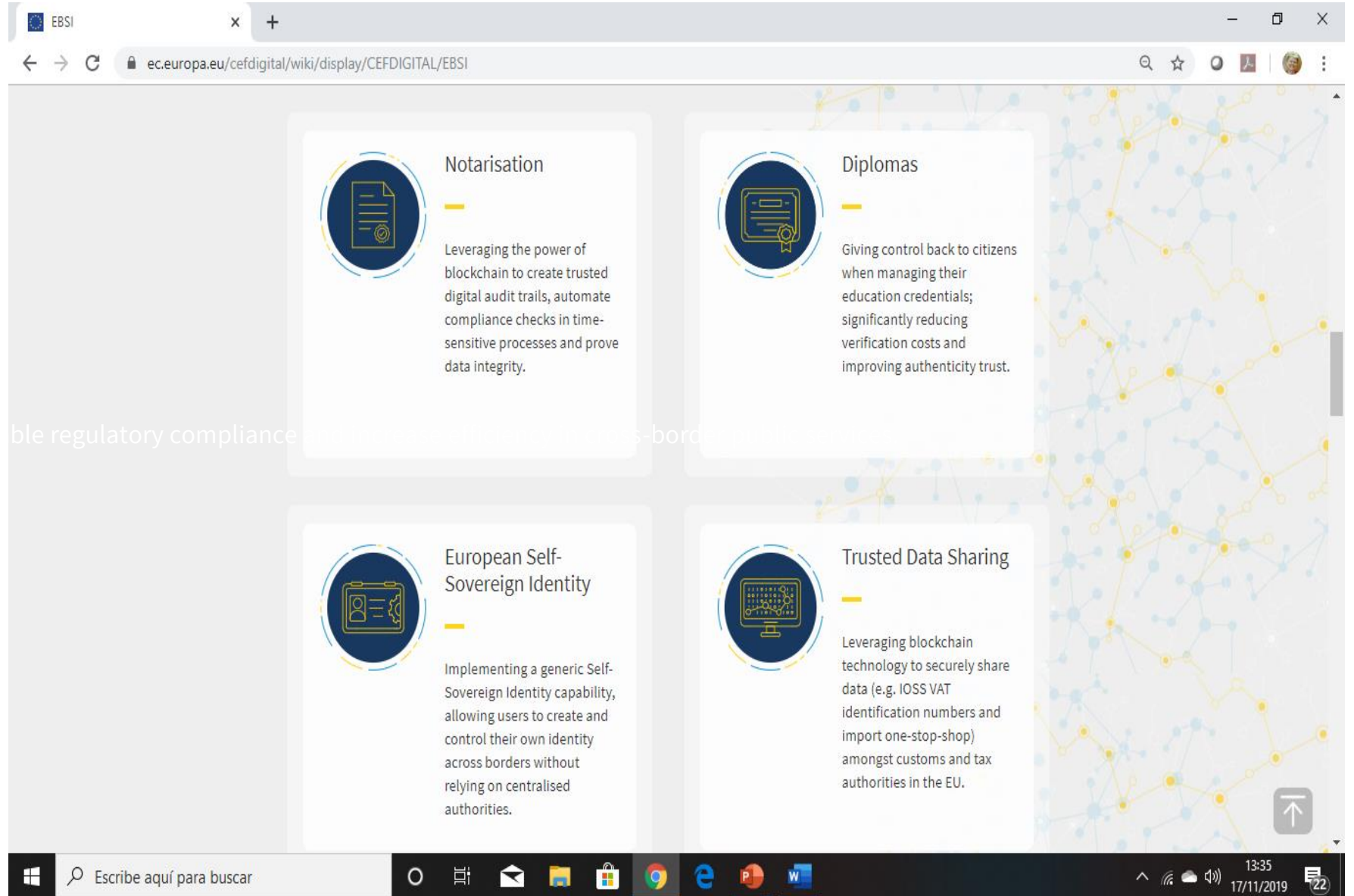
- A **layer of Use Case-specific** APIs developed to enable business applications to interface with the node.
- An **infrastructure layer** with capabilities common to all Use Cases. This layer will include generic capabilities and connectivity to Blockchain networks.

The diagram illustrates the EBSI architecture, organized into five horizontal layers. The top layer, 'USE CASES', features four yellow boxes with icons: 'Notarisation' (document with seal), 'Self Sovereign Identity' (ID card with gear), 'Diplomas' (diploma with seal), and 'Trusted Data Sharing' (network diagram). Below this is the 'SAMPLE COMMON APPLICATIONS' layer, a grey bar with three icons: 'Time Stamp' (clock), 'Electronic Signature' (document with signature), and 'Electronic Seal' (document with seal). The third layer, 'PLATFORM COMPONENTS', consists of four boxes: 'Identity & Access Management', 'Data Management', and 'Interfaces to Systems of Record', connected by lines. The bottom two layers, 'INFRASTRUCTURE', are 'Blockchain and Data Technologies' (yellow bar) and 'Network Connectivity' (dark blue bar). Ellipses (...) indicate connections between 'USE CASES' and 'SAMPLE COMMON APPLICATIONS', and between 'PLATFORM COMPONENTS' and 'Blockchain and Data Technologies'.

More on EBSI



<https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/EBSI>



The screenshot displays the EBSI (European Blockchain Services Infrastructure) website. The browser address bar shows the URL: ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/EBSI. The website content is organized into four main sections, each with a circular icon and a brief description:

- Notarisation**: Leveraging the power of blockchain to create trusted digital audit trails, automate compliance checks in time-sensitive processes and prove data integrity.
- Diplomas**: Giving control back to citizens when managing their education credentials; significantly reducing verification costs and improving authenticity trust.
- European Self-Sovereign Identity**: Implementing a generic Self-Sovereign Identity capability, allowing users to create and control their own identity across borders without relying on centralised authorities.
- Trusted Data Sharing**: Leveraging blockchain technology to securely share data (e.g. IOSS VAT identification numbers and import one-stop-shop) amongst customs and tax authorities in the EU.

The background of the website features a network diagram with blue and yellow nodes connected by lines. The Windows taskbar at the bottom shows the search bar with the text "Escribe aquí para buscar" and various application icons. The system clock indicates the time is 13:35 on 17/11/2019.

**Governments provide services that
allow their citizens to fulfill their
human potential**

**Therefore
the design and implementation of
effective and efficient services is much
more than just a question of making
the best use of taxes**

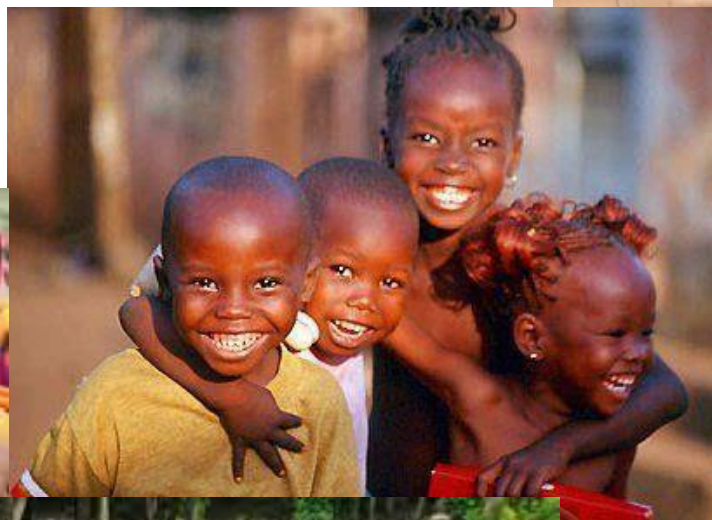
**So it is important that developing countries have
the tools available to implement blockchain in
public services**

Including open-source, free standards

**Failing to ensure this will not just widen the
information technology gap**

**It will widen the gap between developed and
developing countries in all areas of human
development**

It is an opportunity to create a better future for them





Thank you!

Virginia Cram-Martos
crammartos@triangularity.net