



TRUSTWORKS

RETHINKING IT AND BUSINESS

Customs and Border Protection Advanced Developments Encompassing Processes & Technologies, Workshop 2, Northeastern University, Boston, July 17th 2019

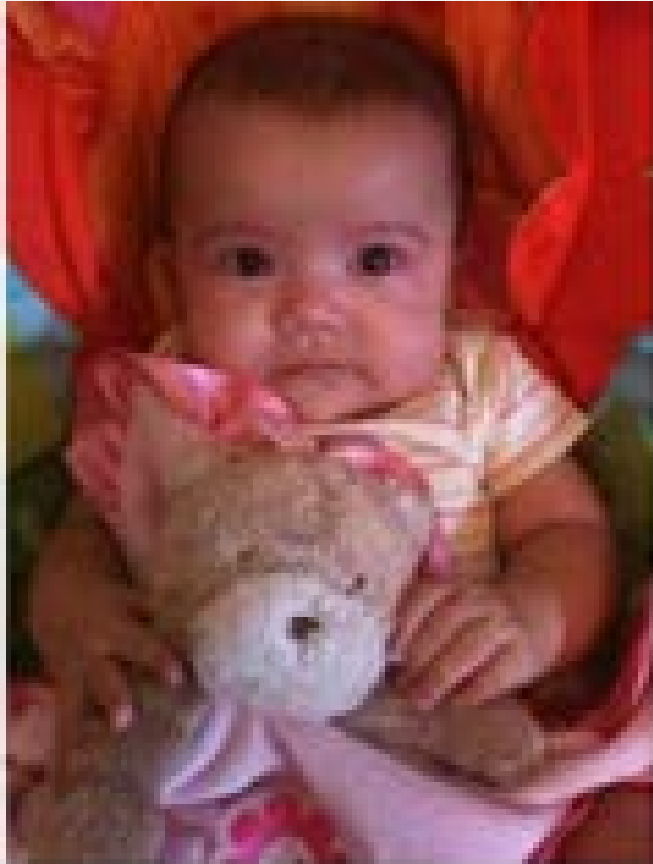
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So What? Who Cares?

- Mission: Reducing trade barriers through competitively, commercially and politically neutral interoperability infrastructures that enable a *connect once to share with everyone* scenario on a global level.
 - Reducing supply chain barriers to trade could **increase global GDP by nearly 5% and trade by 15%**
- Problems needing solutions: How to effectively digitize cross border interoperability on a global scale?
 - **How to realize a global digital infrastructure** that is competitively, commercially and politically neutral?
 - **How to establish global collaboration** that realizes an infrastructure that supports traders' business network digitization?
- Solutions and recommended activities for US-CBP
 - **Drive realization of a shared digital Global Trade Identity (GTID):** Where businesses and governments can instantaneous validate the trustworthiness of any legal entity, which they intend to engage with in a business interaction.
 - **Drive realization of global interoperability among national trade single windows:** To maximize the benefits from a National Trade Single Window, coverage should be extended to include the cross-border electronic data exchange of all information.
 - **Investigate** blockchain's potential as a technology that can offer a neutral global digital interoperability infrastructure
- Contact me (Henrik.Hvid.Jensen@Trustworks.dk, +45 2299 8755) – For blockchain investigation, GTID realization, TSW interoperability and Tradelens



Shifting focus from EGOsystem optimization



"Mine"



Towards Business Ecosystem optimization



"Mine"



"Ours"



"The conventional wisdom is that competition in the future will not be company vs. company but supply chain vs. supply chain."

James Blayney Rice, MIT





Realizing a shared digital Global Trade Identity for businesses and governments is a foundational step in digital supply chains;

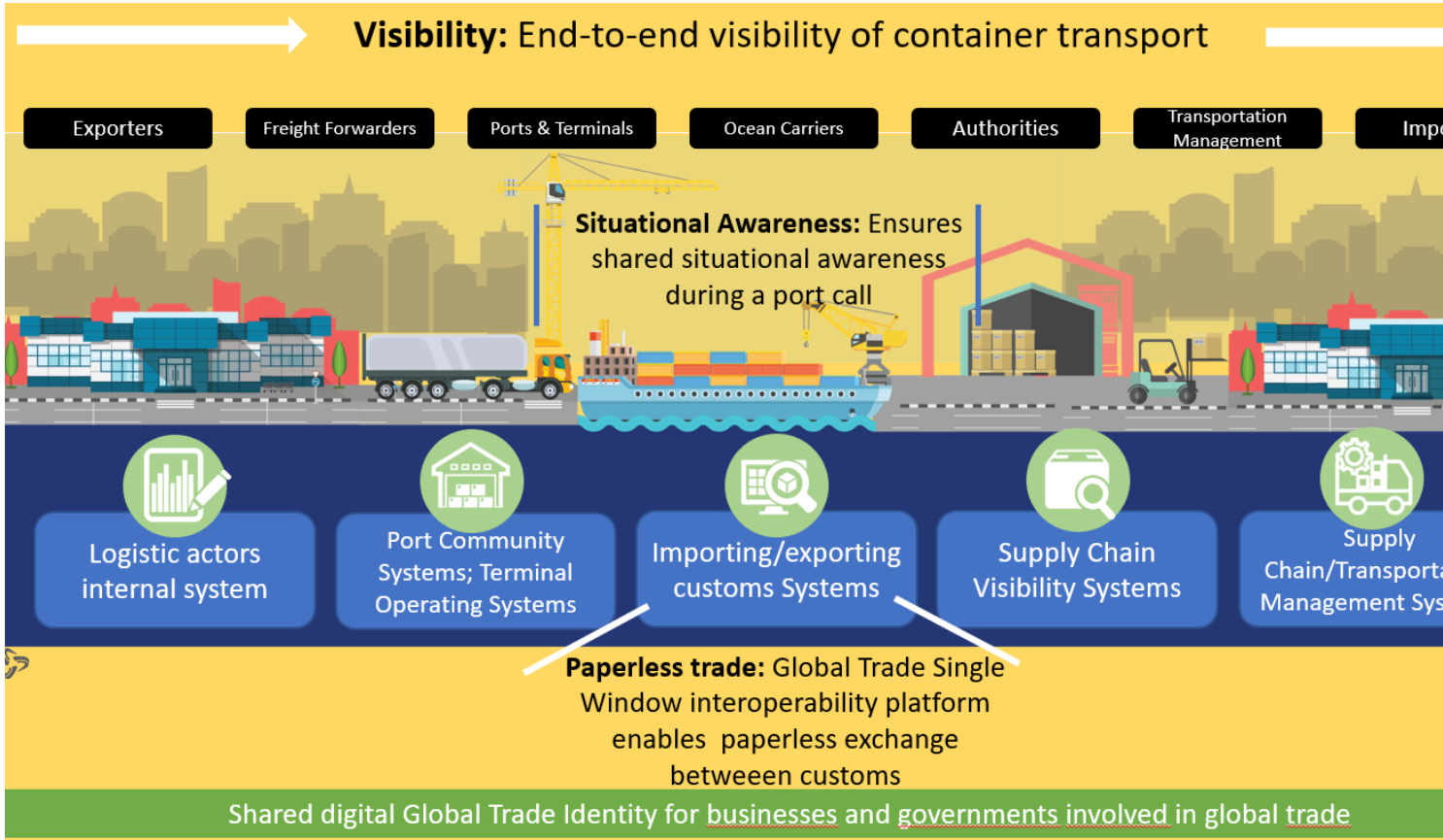
Key take away: Digital signatures on permits, licenses, certificates etc. are globally recognizable

- You know it is issued by an authorized entity
- You know it hasn't been tampered with

Global supply chains need a comprehensive system for the verification and management of digital business identities that is both dynamic and trustworthy

- Current digital identity management systems are costly, inefficient, and may not be sustainable.

Will remove many of the practical realization barriers for digital cross-border interoperability



Global Trade Single Window interoperability platform

Key take away: Any permits, licenses, certificates etc. can be shared digitally with any supply chain actor

Connect Once to Share with Everyone - Instead of bilateral/regional interoperability

UNECE conclude that to maximize the benefits from a National Single Window, coverage should be extended to include the cross-border electronic data exchange of all information.

A foundational step in paperless trade

Will accelerate the removal of paper documents in global trade.

Minimal changes to existing TSWs

Reducing global trade barriers and increasing efficiency across international supply chains

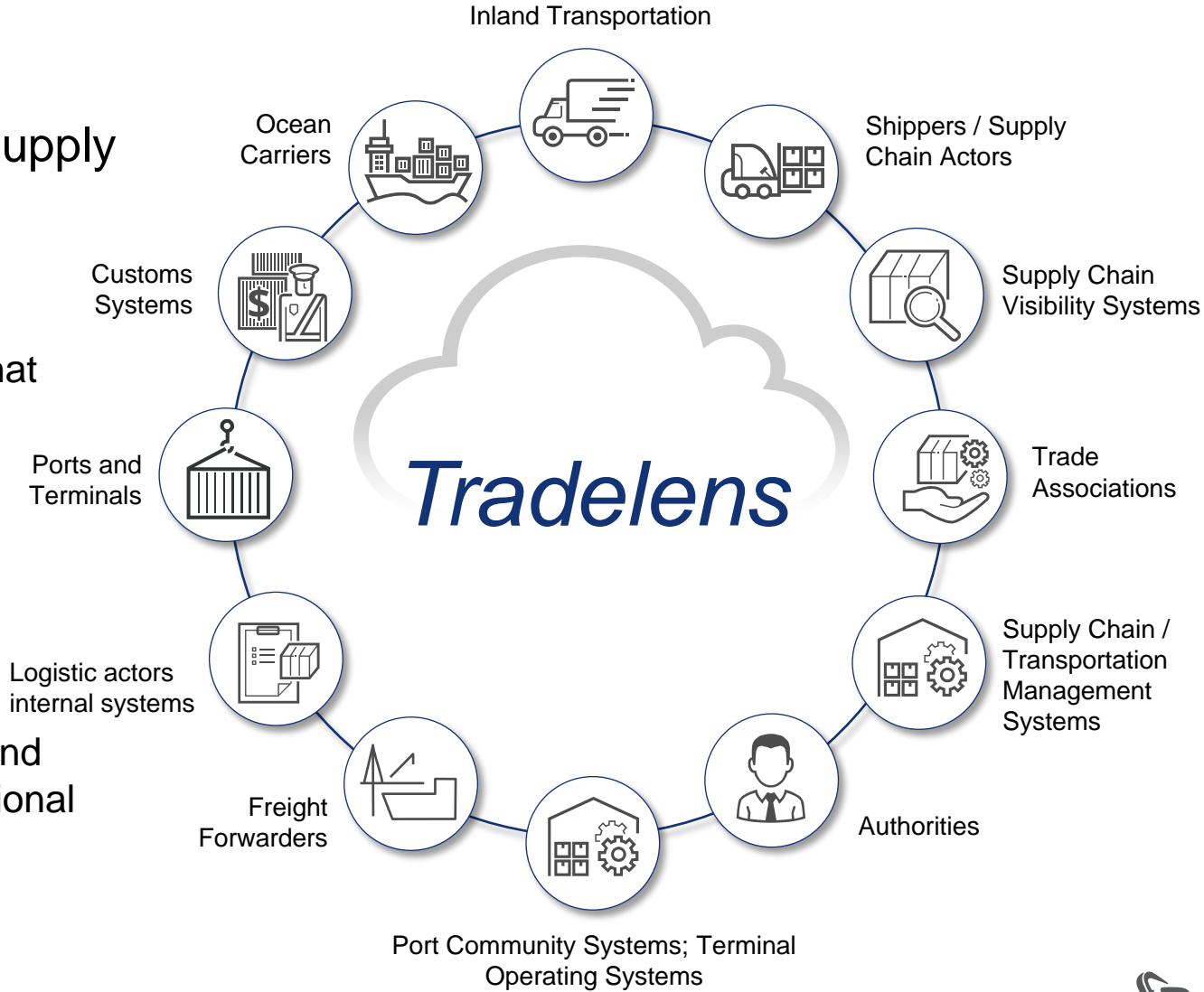
Bringing to market an ecosystem platform for containerized shipping connecting the entire supply chain ecosystem

1 Shipping information pipeline

Will provide **end-to-end supply chain visibility** that enables all actors involved in a global shipping transaction to securely and seamlessly exchange shipment events in real time

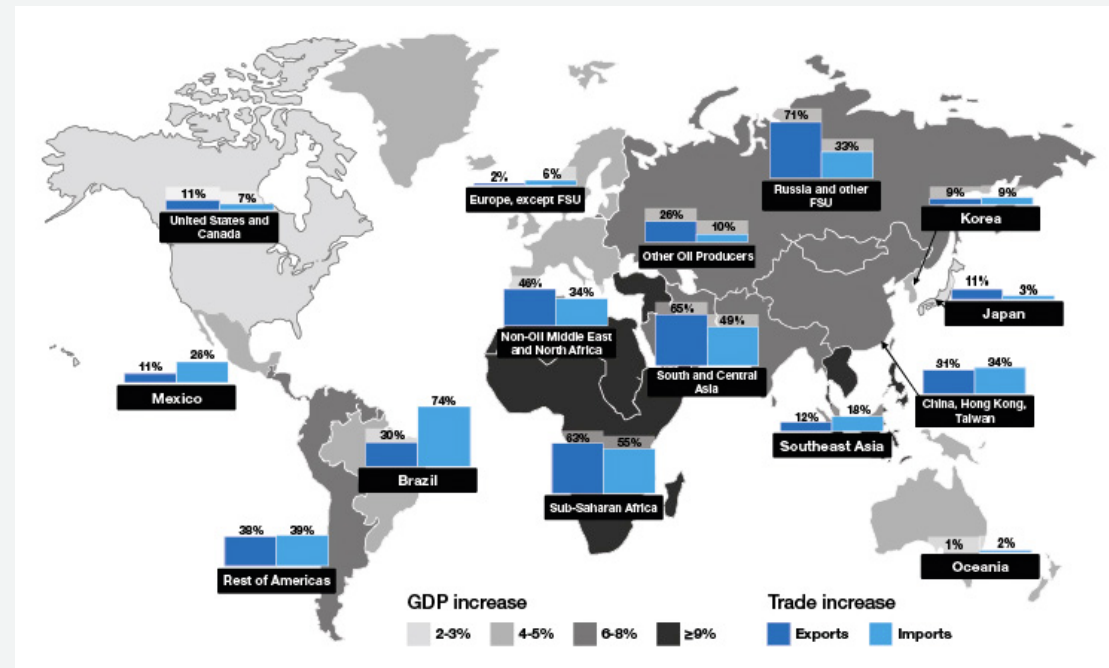
2 Paperless trade

Will **digitize and automate paperwork filings** for the import and export of goods by enabling end users to securely submit, stamp and approve documents across national and organizational boundaries



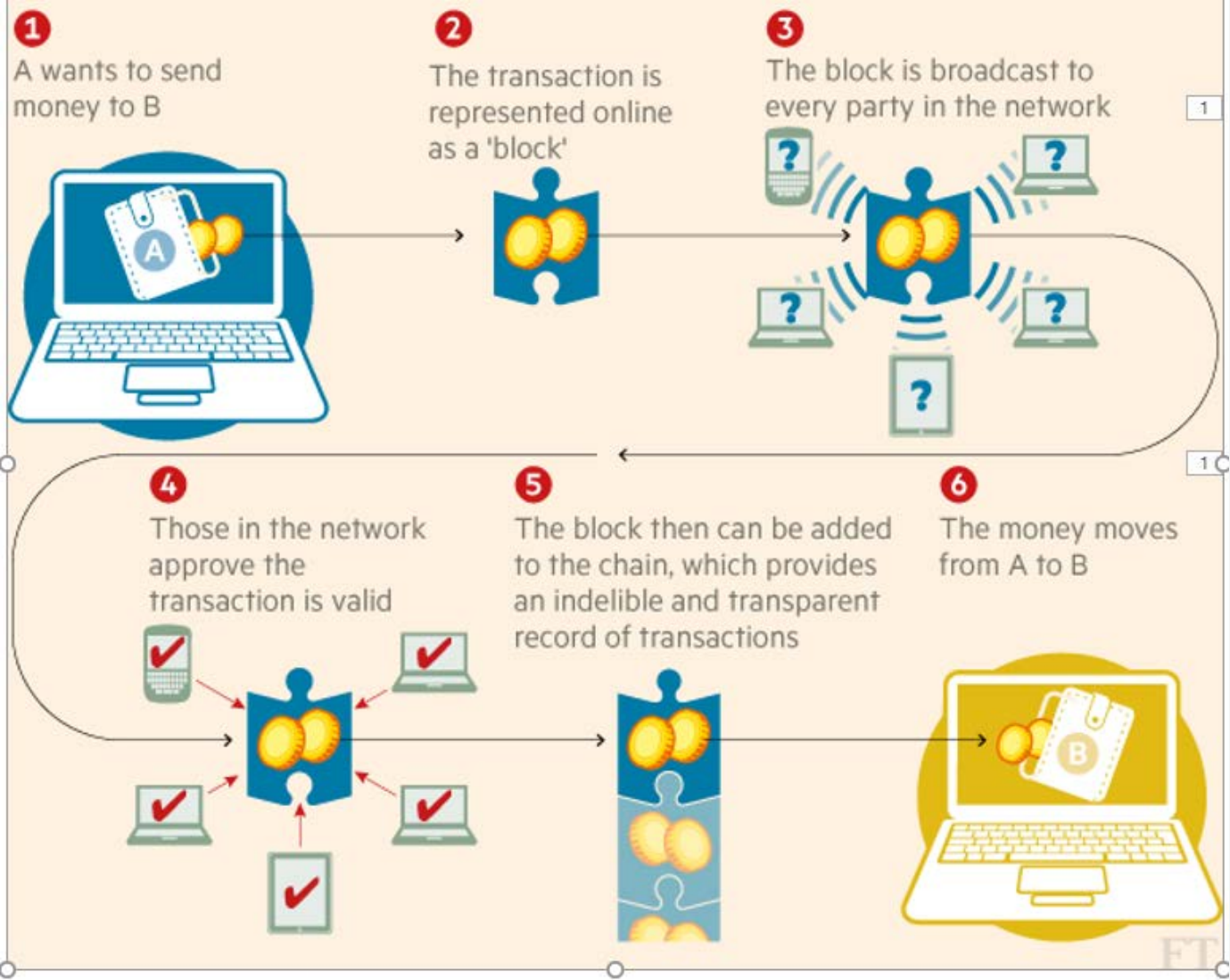
Digital Supply Chain optimization will contribute to increase in global GDP and Trade

- **Key take away: Reducing supply chain barriers to trade could increase global GDP by nearly 5% and trade by 15%***
- Supply chain barriers can result from
 - Inefficient customs and administrative procedures, complex regulation and weaknesses in infrastructure services, among many others.
 - Lowering supply chain barriers is effective because it eliminates resource waste and reduces costs to trading firms and, by extension, lowers prices to consumers and businesses.



*Details: [World Economic Forum - Enabling Trade: Valuing Growth Opportunities](#)

How Blockchain works



Different ways to handle trust

Today: Individual ledger - Each party holds their own ledger

You trust known parties and transactions are stored in individually controlled ledger

Direct interactions without middleman

One to one connection



Today: Centralised Ledger - A middleman trusted by both parties bridge trust between parties unknown to each other

The middleman controls the interaction history, identities and interface

The middleman controls the value chain

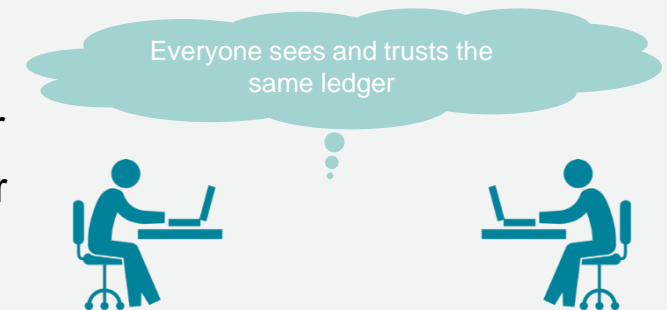
Great if the business eco-system can agree on a trusted middleman



Blockchain: Distributed ledger - Independent blockchain nodes verifies legitimacy of transaction and stores the transaction in a shared immutable ledger

What I see is what you see - Remove duplication, inconsistency and the need for reconciliation of records

The "business eco-system" controls the value chain



Blockchain's single value proposition: Decentralization

- If you are not replacing a trusted third party or preventing one from emerging do not use blockchain
- But, blockchain is also the incumbents' protection against disintermediation by digital platforms
- **Key take away: Blockchain offers a competitively, politically and commercially neutral alternative to centralized platforms**



U B E R

Largest taxi service owns no taxi vehicles.

facebook

Largest media company creates no content.

You Tube

Largest entertainment company produces no content.



Largest global retailer has no inventory, and no stores.

Google

Leading software & services brand monetizes people, not software.

airbnb

Largest hospitality company owns no real-estate.

Q2

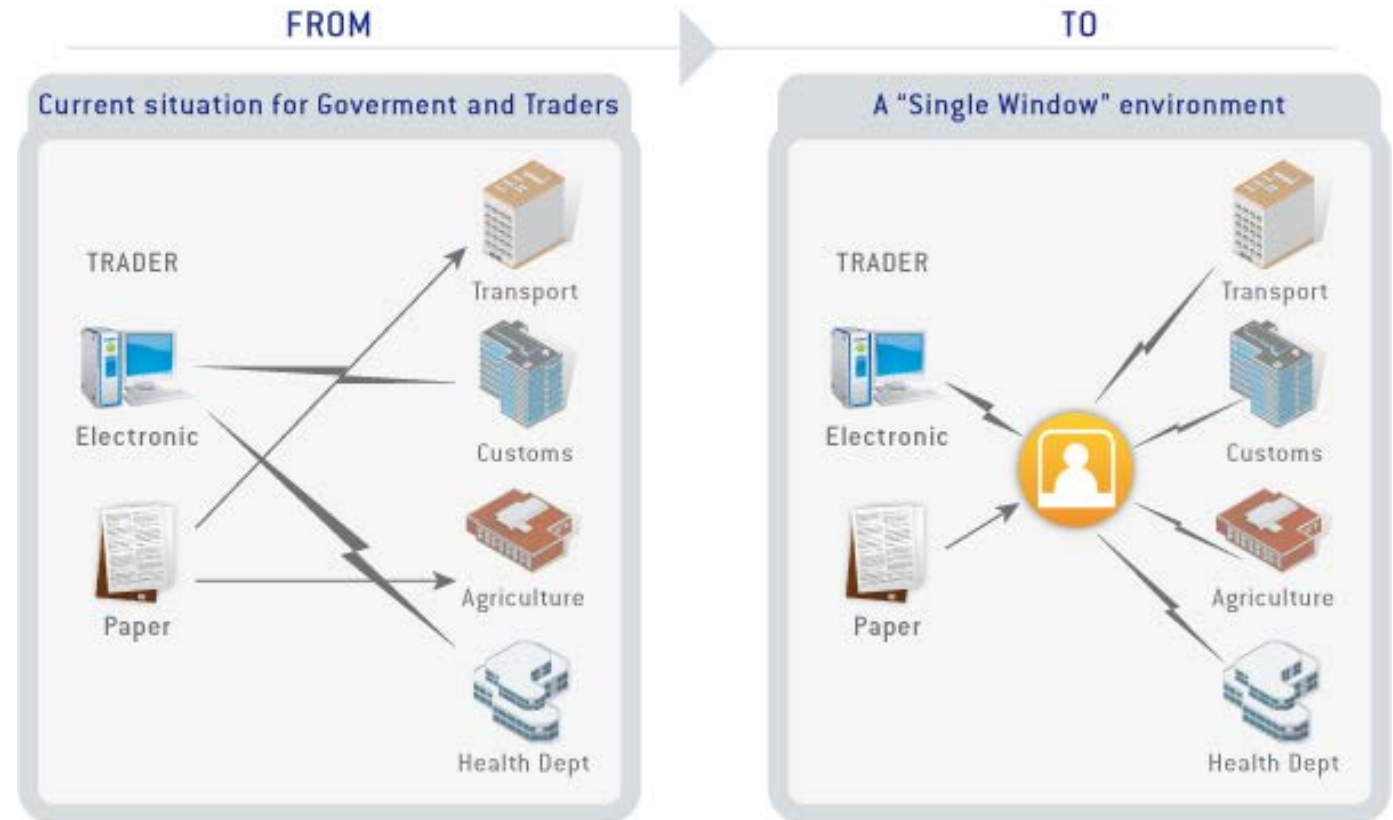
Blockchain do
not offer
additional
security

You can get equally security levels
on centralized solutions

But, the emergence of blockchain
has made it possible to build
decentralized solutions with a
security level that matches
centralized technologies

Distinguish between digitization benefits and decentralization benefits

- 80-90 % of the current blockchain initiatives are centralized digitization efforts, using decentralization technologies - They will fail!
- **Key take away: If you do not have a decentralization use case – Blockchain is not the right choice**



A Trade Single Window is a facility that allows parties involved in trade and transport to lodge standardized digital information and documents with a single entry point to fulfill all import, export, and transit-related regulatory requirements. The individual data elements should only be submitted once.

US-CBP should take initiative to realize global digital G2G interoperability infrastructures

Key take away: A neutral G2G infrastructure with full visibility, trustworthy digital signatures and immediate sharing of permits, licenses and certificates is technical fairly simple



Drive realization of a Global Trade Identity

Build a simple PoC solution for GTID – Using the model from World Economic Forum

Validate and demonstrate the G2G benefits with 3-5 countries.

6 months project

Engage the global trade community through World Economic Forum or similar institutions

Result: Validated the technology and documented the G2G benefits



Drive realization of global interoperability among national trade single windows.

Build a simple PoC TSW-interoperability – Can be done using existing iPaaS

Validate and demonstrate the G2G benefits by piloting 3-5 countries TSW on the infrastructure

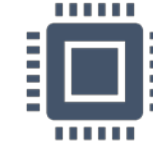
6 months project

Result: Validated the technology and documented the G2G benefits



Get global visibility

Maersk Tradelens and similar solutions will enable shared global visibility – understand what that means for risk assessment



Investigate blockchain's ability to offer a neutral global digital interoperability infrastructure

Can be implemented on non-blockchain technologies, but blockchain offers some interesting neutrality opportunities, however, adds governance complexity

Result: Understand if Blockchain is the right technology for global digital G2G interoperability

Thank you

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Identity system principles for a shared digital Global Trade Identity (GTID)



Principles for an inclusive digital Global Trade Identity

- GTID requires global collaboration, and such collaboration must be based on principles designed for neutrality and inclusivity
- [WEF's GTID White Paper](#) recommends a model that supports these principles and ensures
 - A digital Global Trade Identity infrastructure where business and governments can manage their own identity without relying on a third party.
 - Each party can present the verifiable identity credentials they prefer, and the receiving party is able to use its own internal business rules and regulations for validating the trustworthiness of the presented identity credentials.
 - To enable inclusive global trade, GTID supports businesses of any size;
 - Each country's required investment is insignificant, and GTID supports even countries with very limited digitization level.
 - The model also ensures that no single entity controls important components of GTID, protecting it from shifting political priorities.



Figure 1

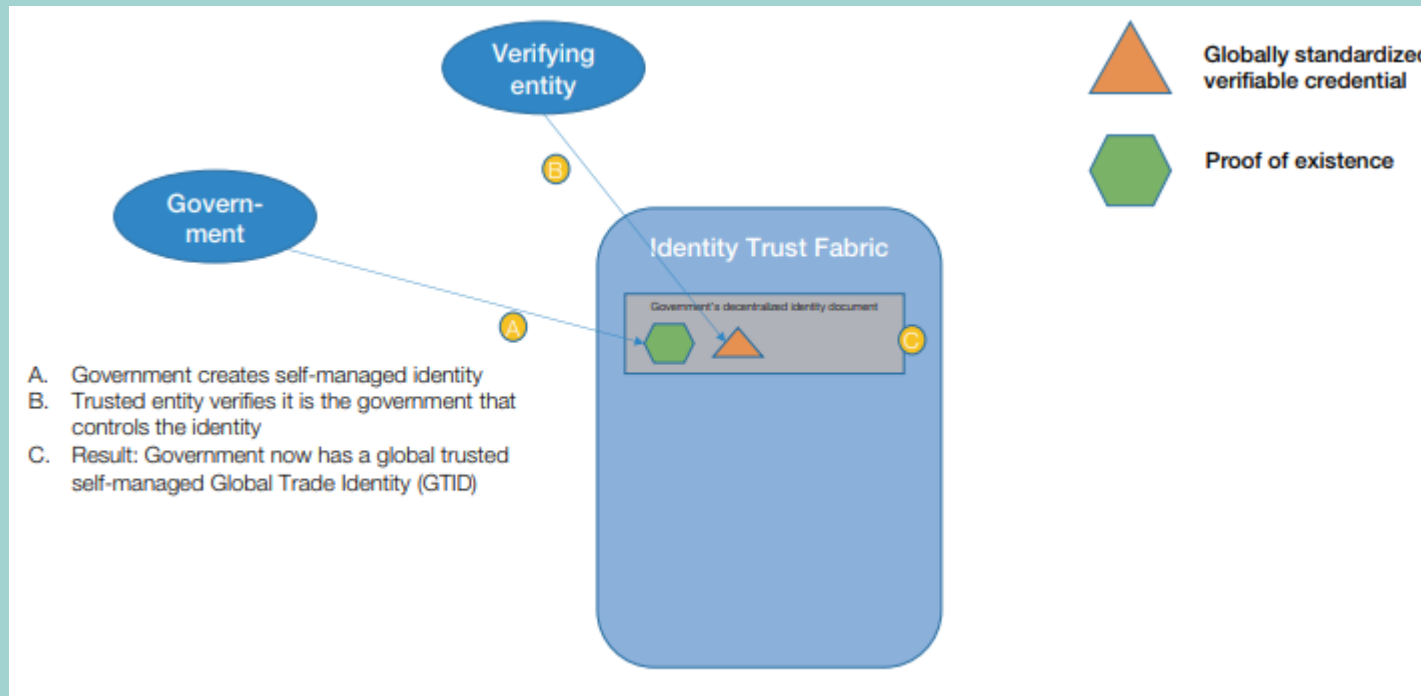
Backup slides

Proposed digital identity model for future supply chains



Trust between governments (Step 1/4)

The main challenges in digital G2G interactions include trusting that a digital LPCO – such as a certificate of origin, an inspection certificate, a special duty-free certificate etc. – was issued in the exporting country by an authorized CBRA, that the LPCO hasn't been tampered with and that only authorized entities have access to the LPCO.



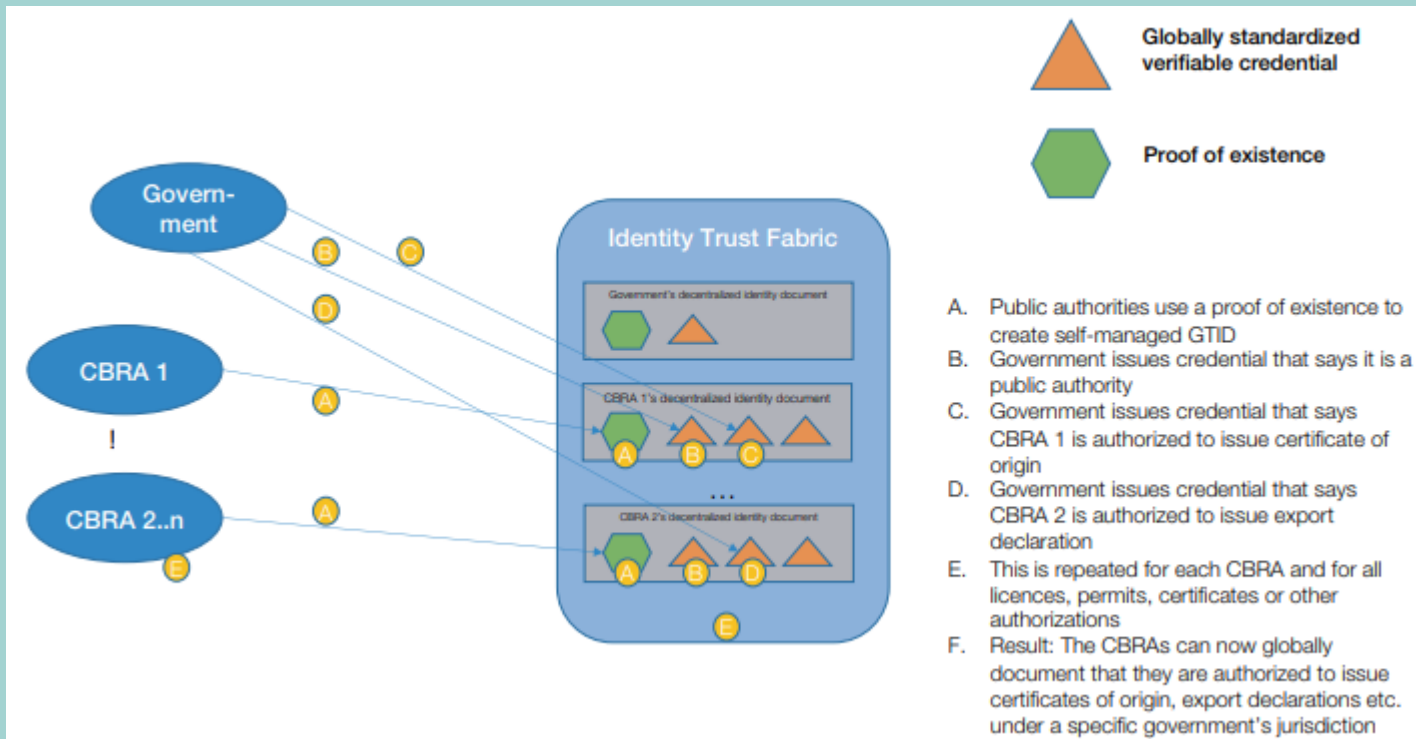
First step – Establishing national government identity:

- Each government issues a globally recognized self-managed digital identity (the GTID) to itself.
- It is necessary to have a global trusted mechanism through which governments can manage their GTIDs. This is referred to as the Identity Trust Fabric (ITF).
- An entity verifies that it is genuinely the government that requested the GTID.
- To support the political neutrality principle, it is recommended that each government decides the verifying entity itself.
 - The identification of the verifying entity is stored as a verifiable credential.
 - If the government has not chosen a trustworthy verifier, then other governments may not trust the GTID.
 - Therefore, there will likely be a global consensus on several entities that are trusted to verify a government.



Trust between governments (Step 2/4)

The main challenges in digital G2G interactions include trusting that a digital LPCO – such as a certificate of origin, an inspection certificate, a special duty-free certificate etc. – was issued in the exporting country by an authorized CBRA, that the LPCO hasn't been tampered with and that only authorized entities have access to the LPCO.

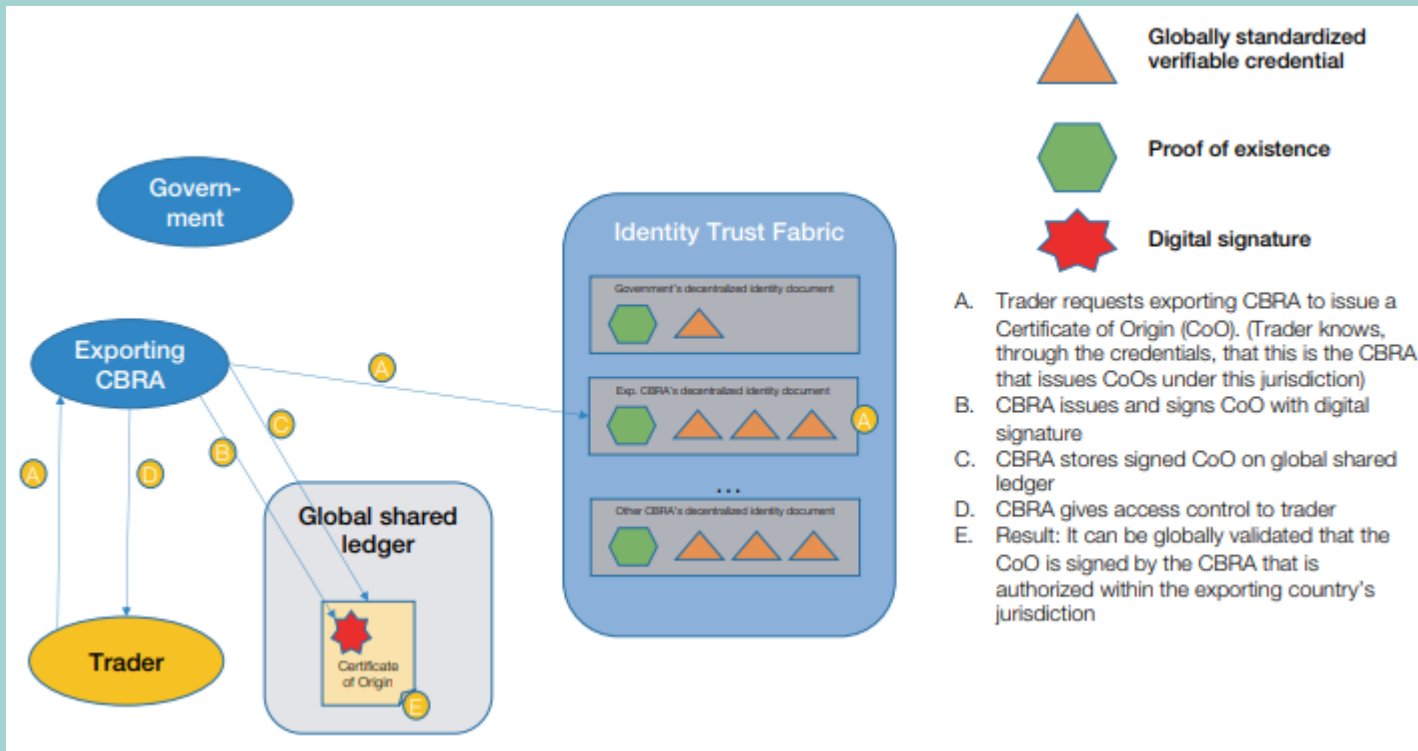


Second step – Establishing each CBRA's GTID.

- The government issues a proof of existence to a CBRA acknowledging it is a public authority under its jurisdiction.
 - The CBRA uses the proof of existence to obtain its self-managed GTID. This step is repeated every time a CBRA in a country is established.
- The government endorses a CBRA to issue a specific LPCO by giving globally recognizable and verifiable credentials to the CBRA.
 - In global trade, there are fewer than 100 kinds of LPCO used regularly. It will be necessary to standardize the verifiable credentials informing that a CBRA is authorized by a government to issue a specific type of LPCO.
- This results in technically simple, cost-effective and politically neutral components that enable a government to confirm that a CBRA is a trusted authority under a specific jurisdiction.
- The CBRA can document through the verifiable credential that it has been authorized to issue a specific LPCO.

Trust between governments (Step 3/4)

The main challenges in digital G2G interactions include trusting that a digital LPCO – such as a certificate of origin, an inspection certificate, a special duty-free certificate etc. – was issued in the exporting country by an authorized CBRA, that the LPCO hasn't been tampered with and that only authorized entities have access to the LPCO.



Third step – an exporting CBRA issues an LPCO in response to a request from a trader

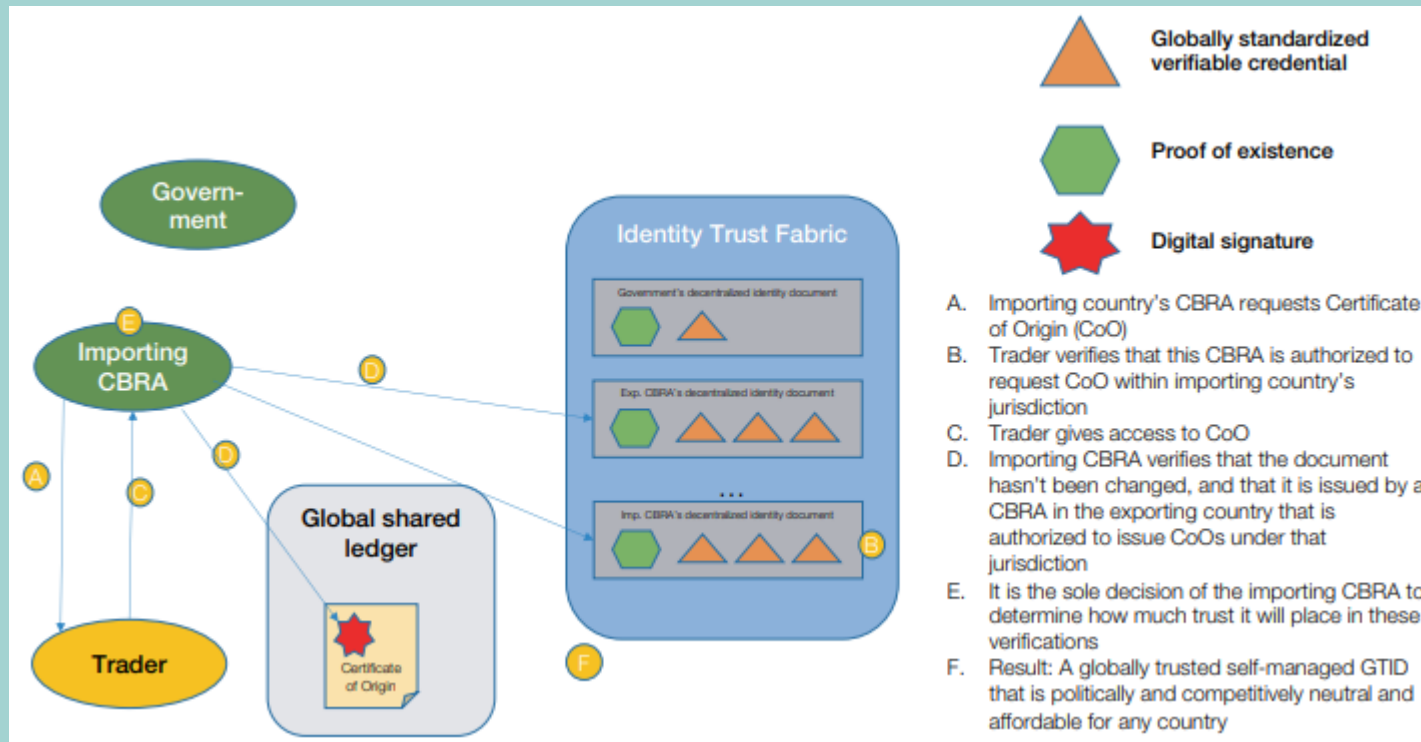
response to a request from a trader

- An example of an LPCO can be a 'certificate of origin' (CoO), a document widely used in international trade, which a trader typically requests from the CBRA
- The illustration shows how the CBRA uses the GTID to sign the CoO and thereby enable other entities to validate that it is authorized to issue a CoO.



Trust between governments (Step 4/4)

The main challenges in digital G2G interactions include trusting that a digital LPCO – such as a certificate of origin, an inspection certificate, a special duty-free certificate etc. – was issued in the exporting country by an authorized CBRA, that the LPCO hasn't been tampered with and that only authorized entities have access to the LPCO.



Fourth step – An importing CBRA verifies the LPCO

- A CBRA in the importing country can verify that the exporting CBRA which has digitally signed the LPCO is an authorized issuer of a specific LPCO under the exporting country's jurisdiction.
- How the importing CBRA reacts based on this verification depends on the local jurisdiction, the amount of trust it has in the exporting country's proofing, validation and governance process, and the CBRA's internal business rules.
- The model uses conventional technologies such as digital signatures, hashing and standard encryption to ensure nonrepudiation.
- As a result, the importing CBRA knows it is the original document and that it has not been tampered with.



Backup slides

Enabling trade



Reducing supply chain barriers to trade could increase global GDP by nearly 5% and trade by 15%

- Gains in GDP associated with trade facilitation would take place in all regions, though they would be concentrated in those with the greatest improvements.
- In the more ambitious scenario, these would include sub-Saharan Africa, South Asia, and parts of Central and West Asia (labelled “Rest of Asia” in figures below), as well as other developing regions.
- Economic gains from barrier reductions are more evenly distributed across countries than the gains associated with tariff elimination, which disproportionately accrue to specific countries, such as Russia and China.

	Ambitious scenario <i>(Countries raising their performance halfway to global best practice)</i>		
	Increase in GDP (%)	Increase in exports (%)	Increase in imports (%)
Total	4.7	14.5	14.9
Oceania	4.3	0.5	2.2
China, Hong Kong SAR, Taiwan	7.6	30.6	33.8
Japan	2	10.9	2.9
Korea	4.9	8.8	8.9
South-East Asia	9.3	12.1	18.4
South and Central Asia	8	65.2	49.3
US and Canada	2.8	11.3	6.7
Mexico	4.4	11.2	26.3
Brazil	3.6	29.7	73.9
Rest of Americas	7.5	37.9	39.1
Europe, except FSU*	4.5	1.7	6.1
Russia, other FSU	7.4	71	33
Non-oil Middle East and North Africa	8.5	45.9	33.8
Sub-Saharan Africa	12	63.1	55.3
Other oil producers	6.8	25.9	9.9



Reducing supply chain barriers requires investment

- If every country improved just two key supply chain barriers – border administration and transport and communications infrastructure and related services – even halfway to the world’s best practices, global GDP could increase by US\$ 2.6 trillion (4.7%) and exports by US\$ 1.6 trillion (14.5%)
- The welfare gains from a trade increase would be substantial, though not every individual or company would benefit.
- Reducing supply chain barriers lowers costs and hence lowers prices, both to consumers and to firms that import production inputs.
 - Consumers gain access to a wider variety of goods.
 - Workers benefit as well, as the boost to GDP is likely to stimulate employment growth.
- In the long run, trade facilitation promotes a shift in resources to more productive industries and firms, thereby increasing productivity and wages.



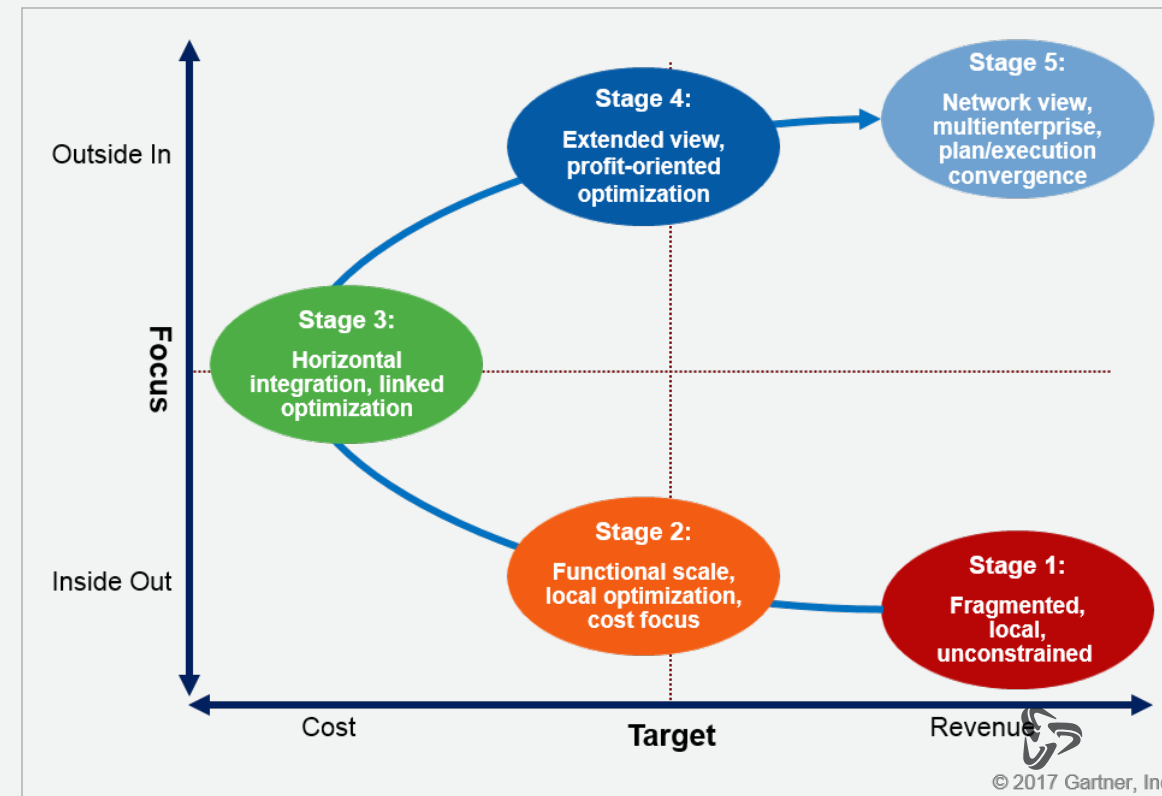
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The move from organization centric digitization to eco system digitization



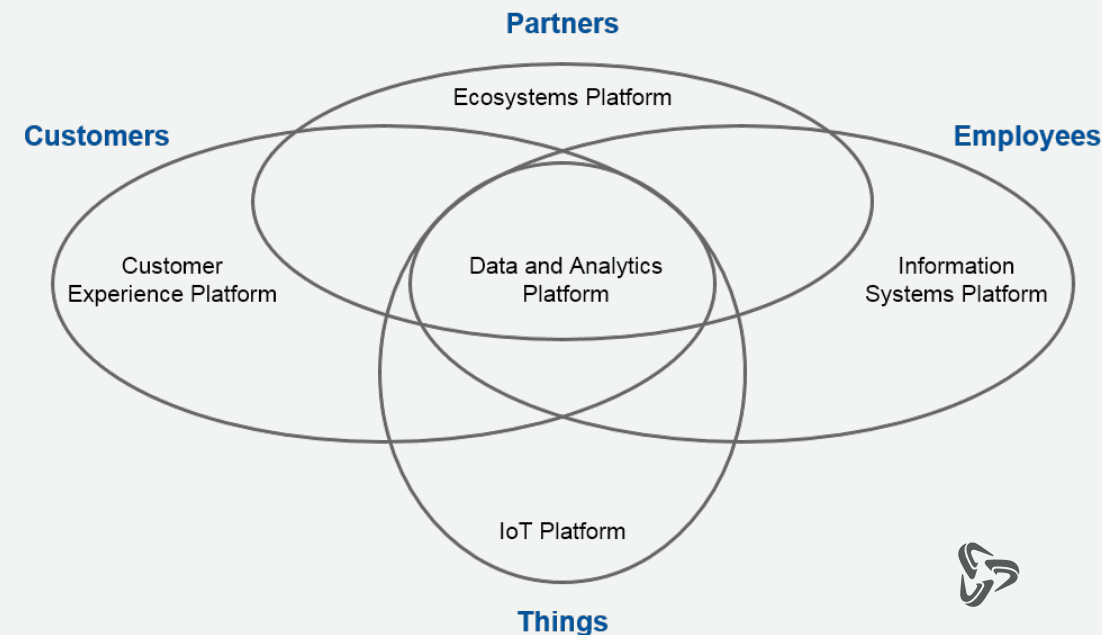
Customs will be a critical component in the supply chain ecosystems in the age of digital business

- Digital business will be having a profound impact on shifting the focus to business ecosystems.
 - The **next wave of innovation** will come from turning attention outward into the business ecosystem
 - A business ecosystem enables various parties to expose their capabilities and leverage the capabilities of others, driving higher levels of business value
- Optimizing the business ecosystem is the central philosophy behind digitization,
 - Giving **everyone in the ecosystem access to the information** needed to make the right decisions to the benefit of the complete ecosystem
 - Allow any container transports ecosystem globally to be **adjusted fluidly and dynamically** without compromising the quality and timeliness of information received.
 - **Mitigate the increased complexity** the business ecosystem will face as number of interconnections increase dramatically.



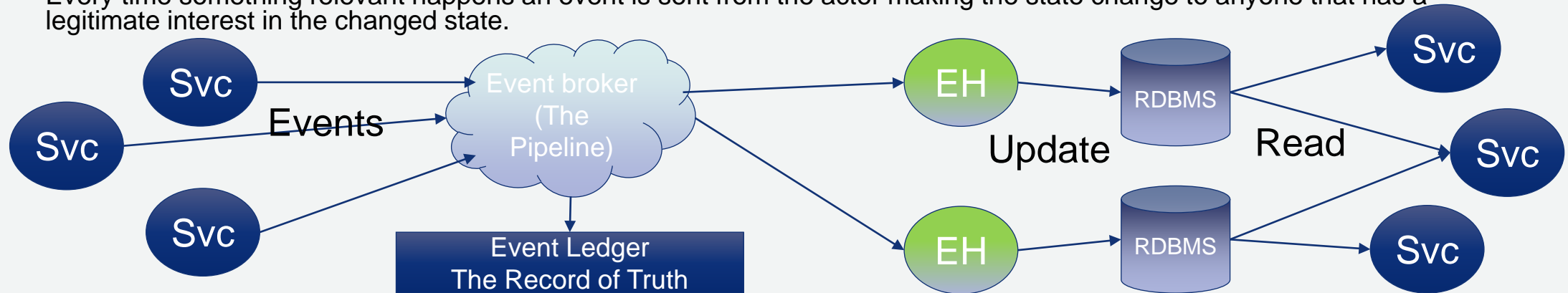
Digital Ecosystem Platforms the trend for digital business ecosystem collaboration

- Allows a **community** of partners, providers and customers to share and enhance digital processes and capabilities
 - **Enable interactions** across the digital ecosystem.
 - Underpin the creation of **new business models** by integrating ecosystems.
 - A stable base of IT services — modular and service-oriented — that **brings together** the organization's own systems and contributions from outsourcers and "as a service" providers.
- The Digital Ecosystem Platform for Logistics
 - Designed to **digitally connect** any actors in the transportation ecosystem
 - Enabling any number of actors to **be dynamically added to** or removed from your eco-system,
 - While still receiving **same quality** of consistent information digitally and in real time.



Event Thinking - IWWIWWIWI – I Want What I Want When I Want It

- An event represents a **change or measure of a monitored state** (Anything that happens)
 - Event producers detect events and publish them to a channel where zero or more event consumers listen for those events on the channel.
 - Event producers and consumers share nothing other than access to the channel and a common understanding of the event object.
- A key distinction of a digital business is that it's **event-centric**,
 - It's always sensing, always ready, always learning and always changing
- **Event Thinking is the foundation** of digital supply chain optimization
 - Every time something relevant happens an event is sent from the actor making the state change to anyone that has a legitimate interest in the changed state.



The API-Economy

- The API economy is about **systems talking to systems**
 - Access to functionality is through an application programming interface (API).
 - The **window to the world** is the API's not the user interface
- Value Adding Services (VAS) will be services offered on top of ecosystem platforms.
 - Build Once – Used Everywhere by Everyone
 - Prevents everyone from building the same generic functionality thereby taking cost out of the supply chain and harmonizing the way the ecosystem collaborates.



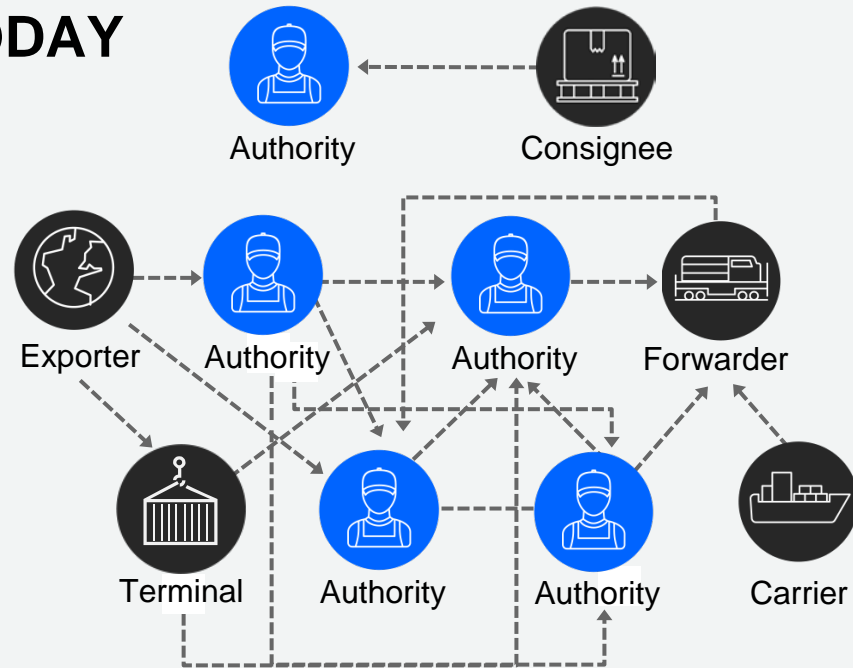
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Tradelens



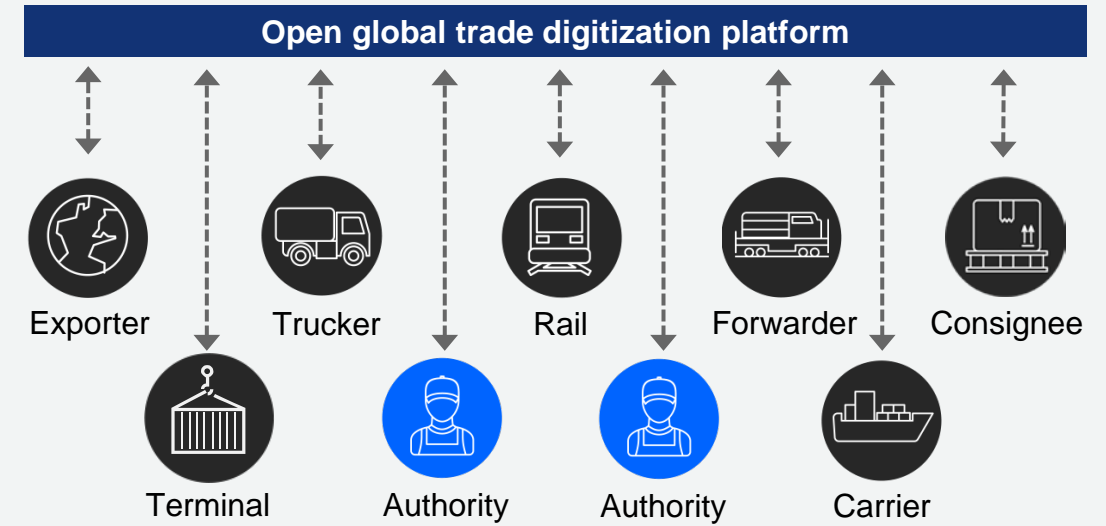
Global supply chain visibility – Maersk Tradelens

TODAY



- Inconsistent information across organizational boundaries and “blind spots” throughout the supply chain hinder the efficient flow of goods
- Complex, cumbersome, and costly peer-to-peer messaging
- Manual, time-consuming, paper-based processes
- Risk assessments often lack sufficient information; clearance processes subject to fraud
- The administrative cost of handling a container shipment is comparable to the cost of the actual physical transport

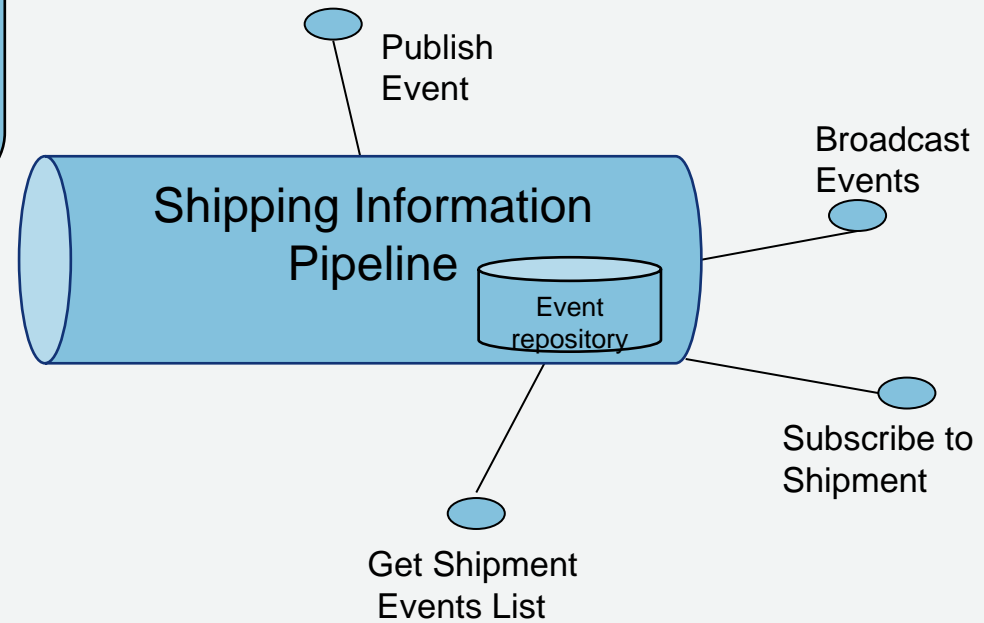
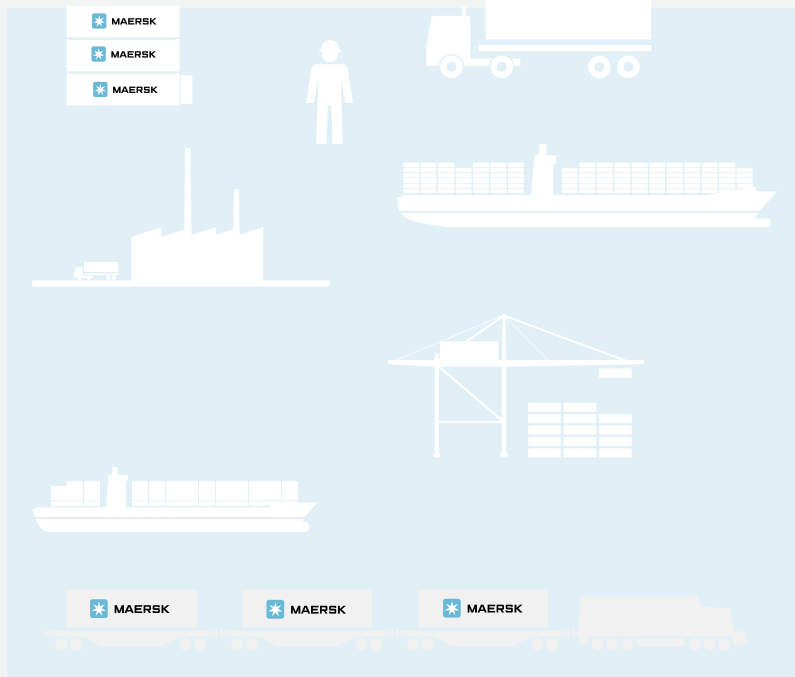
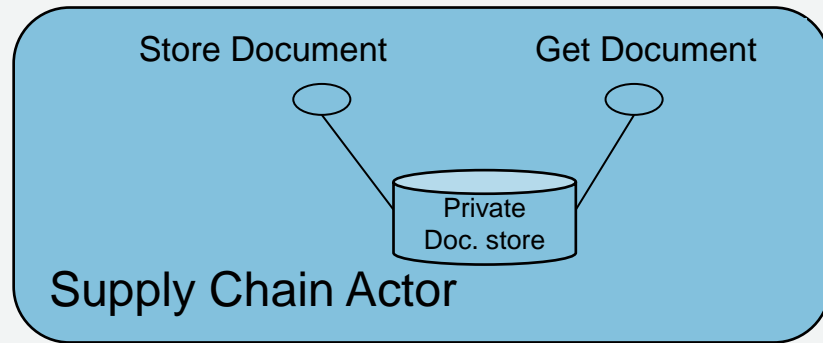
TOMORROW



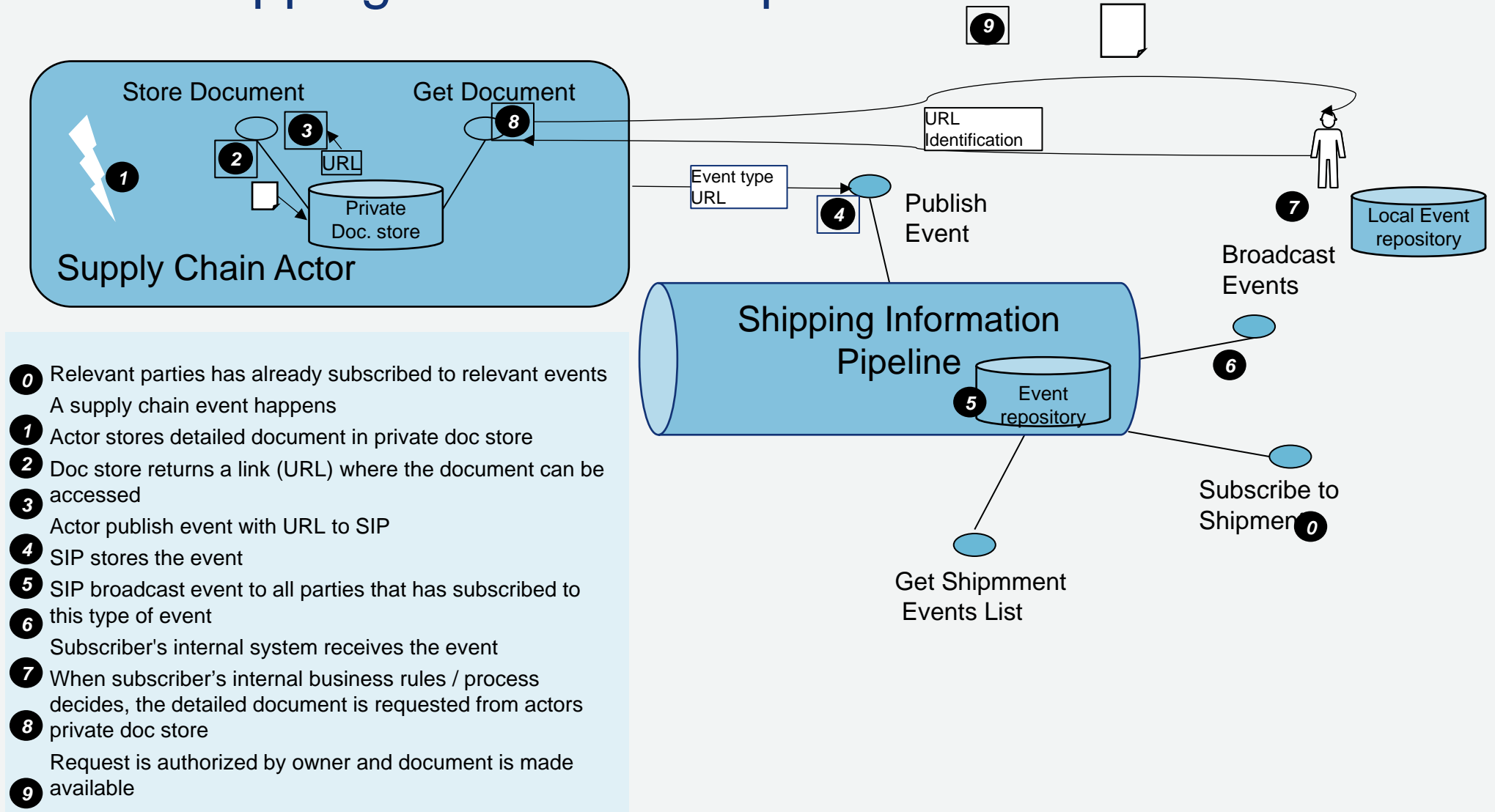
- Instant, secure access to end-to-end supply chain information - single source of the truth
- Assurance of the authenticity and immutability of digital documents
- Trusted cross-organizational workflows
- Supply chain documents remains under the control of the source – No shared document database
- Complimentary not substitutional to existing SCM/TMS-solutions - Everyone keeps their existing IT-system
- As neutral as the Internet – Shaped by the ecosystem



How does the Shipping Information Pipeline work?



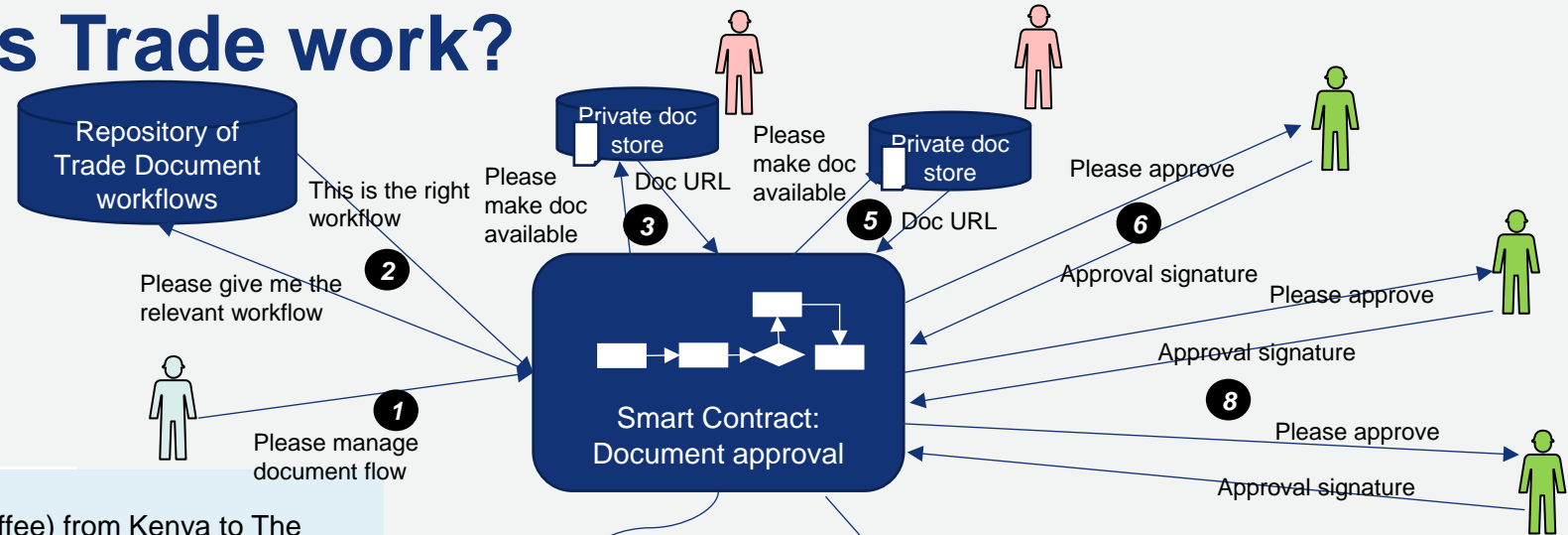
How does the Shipping Information Pipeline work?



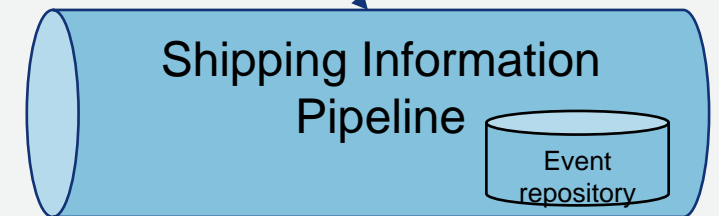
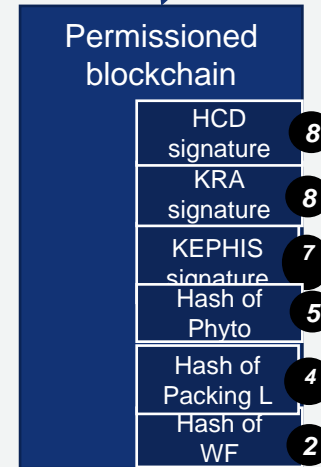
How does Paperless Trade work?

Transparency for permissioned actors

- Document workflows are visible
- Smart contract code is visible
- Blockchain is visible



- 1 Coffee Ltd wants to transport a commodity (Coffee) from Kenya to The Netherland and asks Paperless Trade to manage the document workflow
The Smart Contract request the relevant workflow and store a hash of the workflow on the blockchain
- 2 The Smart Contract executes the workflow and request shipper to make a document (e.g. packing list) available
- 3 The Smart Contract hash the packing list and stores the hash on the blockchain
- 4 The Smart Contract request Inspection to make a Phyto document available and the hash is stored on the blockchain
- 5 The Smart Contract request KEPHIS to approve the documents
- 6 KEPHIS' signature is stored on the blockchain
- 7 KRA and HCD also approves the documents and their signatures are stored on the blockchain
- 8 When everything is approved the Smart Contract sends an Export Declaration Approved event to the Shipping Information Pipeline
- 9



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Blockchain



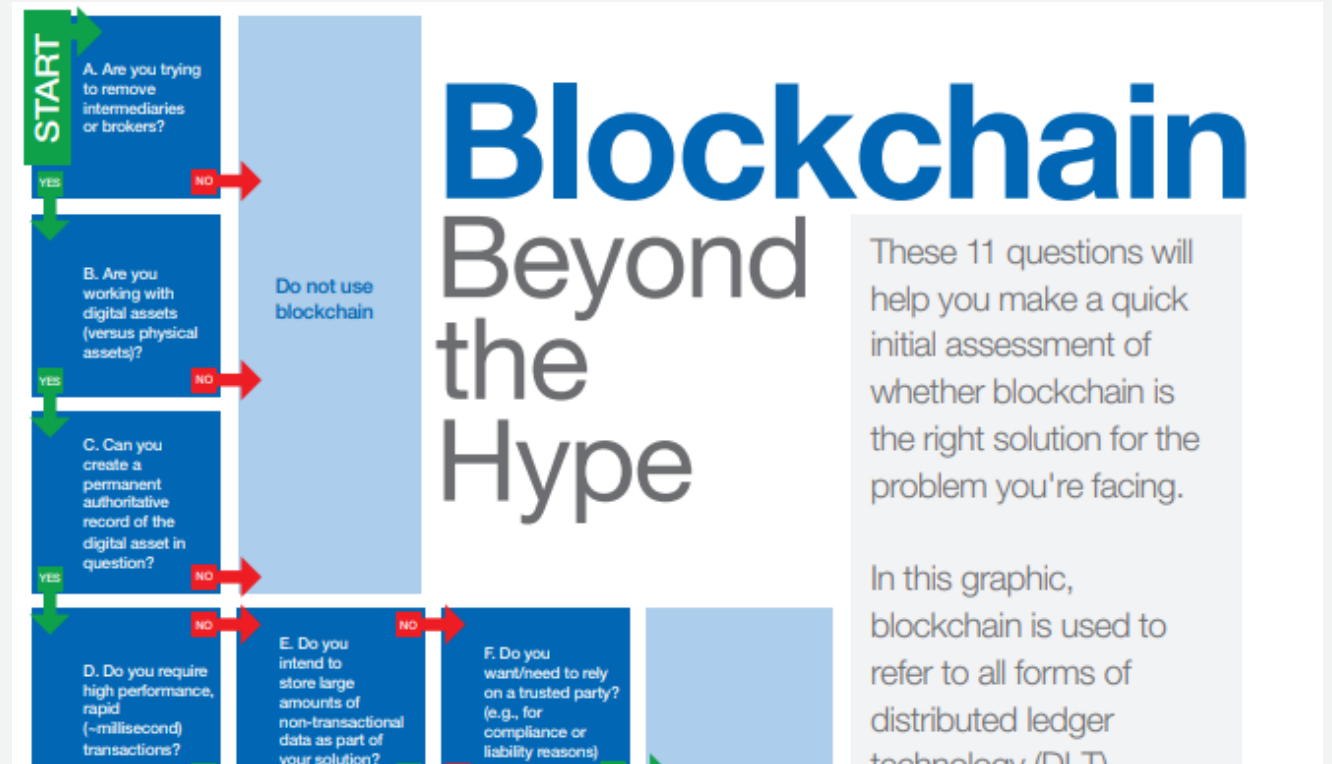
Summarizing Blockchain

- Allowing participants in a value chain to use a shared ledger for their records of operation
 - Distributed among participants
 - Forms an accountability layer that enables
 - Collective trust
 - Shared system authority that define and enforce the system rules collectively.
 - A key design goal is to enable decentralized business processes by implementing decentralized applications.
- Most suited to business ecosystems where
 - There is a dynamic collection of parties
 - Who don't trust/know each other
 - But need to do business with each other
 - Where there are no central authority
- Do not bet on immediate business results.
 - Recognize that while blockchain has the potential to greatly alter supply chains, it could take a decade or more before blockchain achieves its full potential.



Characteristic of business ecosystems most suited for Blockchain

- Having a decentralized peer-to-peer structure of relationships,
- The parties do not necessarily trust/know each other
- They need to do business together to make the ecosystem work
- Parties involved are typically dynamically collected — and most importantly
- There is no central trusted authority, or there is not a willingness among the parties to give power to a central trusted authority.



Four difficult challenges in applying blockchain technology to the disordered ecosystem

- **Technology challenge:** the current generation of technology cannot scale and is not flexible enough
 - Including the simple fact that enterprises can't just go and "buy" a commercial blockchain tool.
 - There will also likely be a provider cycle where initial vendors fail to become sustainable and are replaced by next-generation providers that bifurcate the underlying technology from the business solution that employs the technology
 - Guilty until proven innocent - The technology must also gain trust when it comes to privacy and governance issues.
 - Although early adoption of blockchain will progress over the next three to seven years, mainstream adoption at scale is likely 10 or more years away.
- **Business development challenge:** participants in the disordered ecosystem need to agree to collaborate, including those that compete with each other
 - Similar to RFID in its early days, business processes and standards must be resolved before blockchain can reach its potential.
- **Data interoperability challenge:** even if the technology works and even if competitors agree to collaborate, there is significant effort to define precisely what data will be shared by whom, to meet the range of complex business interactions
 - Companies will need to go through the laborious process of agreeing upon what data belongs in the blockchain, as well as the structure, format and meaning of the data they share.
- **Solution implementation challenge:** after the three other challenges have been overcome, significant effort is required to construct the system, test it and deploy across the diverse set of participants
 - New terminology, concepts and technology usage all mean adoption will take time and patience. Confusion remains rampant today and will only resolve as real solutions emerge.