Informal Ad hoc Expert Group on Conceptual and Technical Aspects of Computerization of the TIR Procedure

Blockchain technology for trans-European systems:

Trigger potential discussions for eTIR

Geneva, 28 June 2018
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<th>1. Study and PoC in the excise domain (EMCS)</th>
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<td>Blockchain as an additional layer to ensure trust in a centralised solution</td>
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<td>Blockchain</td>
<td>End-to-end, transaction-oriented pattern</td>
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| Stakeholders   | • Permissioned blockchain  
• Private blockchain  
• Hyperledger Fabric (open source)                                                                           | • Permission-less blockchain  
• Private network but anchored to a public blockchain  
• Ethereum (open source)                                                                                      |
| TAXUD Project  | No involvement of Member States or Traders                                                                  | With the collaboration of the International Chamber of Commerce                                               |
|                | Technology exploration outside of TAXUD's projects context                                                 | Inscribed in TAXUD's electronic customs MASP (project fiche 3.2)                                               |
**Blockchain basis:** Basic architectural components

**Blocks**
- Store data (e.g. transactions) and are linked in a chain.

**Blockchain network**
- P2P network where each node has a copy of the blockchain.

**Consensus mechanism**
- Mechanism for deciding what blocks are accepted.
  - Consensus example:
    - Proof-of-work
    - Proof-of-stake
Blockchain basis: Blocks

Blocks are made with a header and a body:

**Header**
- Timestamp: 1529822105
- Difficulty: 3,480,508,944,872,181
- Miner: 0x52bc44d5378309ee2abf1539bf71de1b7d7be3b5
- Gas limit: 8,000,029
- Nonce: 0xf7e82a6fc469174c
- Parent hash: 0x60cfb105db211effca2e04a1b278af311e888b

**Body**
- Transaction 1
- Transaction 2
- Transaction 3
- ...
- Transaction n

Contains block metadata and links the block to the previous block

Can contain:
- **Transactions** (e.g. Bitcoin transactions)
- **Documents/declarations**
- **Proof of existence:** hash of document (i.e. fingerprints)
**Blockchain basis: Cryptographic hash**

A cryptographic hash is code assigned to data by algorithm:

```

“Data”  Algorithm  “e1b367a702680e20e8894a00c2d32”
```

Impossible to recover the input data

Different data have different hashes.. ..which can be used to detect changes to data

```

“Data1”  “8a33f09340f7d52”

“Data2”  “ab2f490bd3845e”
```
Blockchain basis: Blocks linkage

Linking provides protection against tampering with data.
Potential uses of blockchain technology in a trans-European system environment

Data sharing

Proof existence through notarisation
The EMCS blockchain PoC: from messages exchanges to data sharing

Validate the technical feasibility of using blockchain to facilitate and monitor the movement of "excise goods" in real-time
What is the EMCS?

“A Trans-European System for monitoring movements of excise goods under suspension of excise duty within the EU (very similar design to NCTS)”
What issues are we facing with the current EMCS?

Central services (CEA) – Common domain

- **NEA Disp to NEA Des (bi-directional)**
- **NEA to SEED (bi-directional)**
- **NEA to CS/MISE (bi-directional)**
- **Ec. Operator to NEA (bi-directional)**

**Interfaces to Traders not harmonised across Member States**

- Long time-to-market for new EMCS releases
- Multiplication of heterogeneous implementations and data sources
- Duplicated development and conformance testing efforts
What did we test in the EMCS PoC? (1/2)

Can we redesign the EMCS using a decentralised system (i.e. get rid of the Central Services)?

Technical feasibility  
Level of complexity  
Costs and benefits

Which scenario?

Scenario 1:  
Government-to-government (common domain only)

Scenario 2:  
Trade digitisation (removing domain boundaries)

Scenario 3:  
Hybrid (a realistic mix of the 2)

Can we redesign the EMCS using a decentralised system (i.e. get rid of the Central Services)?

[Diagram showing different scenarios]
What did we test in the EMCS PoC? (2/2)

Our PoC implements the "happy path"
From messages exchanges to data sharing
The eATA PoC: proof-of-existence through notarisation on the blockchain

- Exploring electronic ATA Carnet notarisation (data anchoring)
- Technical feasibility, key cost drivers and major risks
- Quickly demonstrating feasibility, using Ethereum in the cloud
- Confidentiality, access control, integration, interoperability, security, GDPR, performance and scalability, management of changes, extensions, CAPEX / OPEX and risks
- Implementation started beginning of 2018; results due in September 2018
ATA carnet blockchain Proof-of-concept (PoC)

**What is it?**

- **More than 71 countries** have issued and accepted ATA paper carnets under the ATA convention.
- **+200,000 paper carnets** are issued per year worldwide.
- **ATA carnets digitisation** as part of EU digital customs.

**How does it work?**

Country A

1. **Customs export**

Country B

2. **Customs import**

3. **Customs re-export**

4. **Customs re-import**

Digitisation brings trust issues between stakeholders in a worldwide system.
Use cases description

1. Automation of consistency checks

Use of smart contract to reconcile ATA carnets movements based on metadata stored on the private blockchain to reduce workload for customs.

2. Anchoring of carnets and transactions by the different stakeholders to address the trust issue (proof-of-existence)

Anchoring of ATA carnets and transactions by the different stakeholders to address the trust issue (proof-of-existence).

New transactions (export, import, etc.)

Carnet smart contract (on private blockchain)

Transaction submission

Transaction approval

Frequent Anchoring

Hashes

Private blockchain

Public blockchain

Carnet

Transactions

Transaction

Submission

Approval

Anchoring
State of play on TAXUD blockchain activities

EMCS study and PoC completed; demonstrated blockchain potential

Challenges identified
- Data confidentiality
- Scalability and performance
- Security
- Deployment, operation and re-configuration
- Compliance to data protection & privacy regulations (GDPR..)

eATA PoC implementation started (January 2018 and ongoing)
Next steps

**Actions are being taken**

- Workshop in May 2018 with MS on Blockchain for customs and taxation
- Awareness and training for Policy Officers & technical staff
- Research activities in several critical areas
- Partnership at Commission level to contribute to European initiatives (with DG CNECT, DG MOVE, DG DIGIT)

**Objectives for 2019**

- Validate that we can deploy and operate across MS
- Steer system design in the right direction (policy changes, use cases)
Thanks for your attention!

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