Silicon Economy









The digital consignment note (e-CMR) Agenda







Silicon Economy

CMR as paper-based document

Electronic CMR (eCMR)

eCMR in Silicon Economy

Open Logistics Foundation

Further information





Open. Agile. Intelligent. Silicon Economy - The infrastructure for the logistics platforms of the future.



Gefördert durch:

Bundesministerium für Verkehr und digitale Infrastruktur

aufgrund eines Beschlusses des Deutschen Bundestages

Silicon Economy What is the Silicon Economy?



- Silicon Economy is a federated and decentralized (platform) ecosystem as a counter-design to monopolistic platforms by means of which logistic services can be offered, negotiated, booked, organized, controlled, managed and billed.
 - Federated and decentralized means that services can be offered and used by different companies across different platforms.
 - Platform economy describes Internet-based business models that bring together providers (in the broadest sense) with interested parties in a digital marketplace.
 - Digital ecosystems are socio-technical systems. The term covers not only digital, technical systems, but also includes organizations and people and their relationships with one another.
- Software or infrastructure components are made available as open source and distributed via a development and operating platform.
- The Silicon Economy ecosystem is becoming an enabler of supply chain ecosystems in which goods, autonomously controlled by AI, undergo situationally orchestrated processes.



Silicon Economy Centralized Platform vs. Federated Platform



Centralized platform models promote monopoly and build dependencies, while federated platforms increase interaction among all participants and promote their individual success.

Centralized Platform

Two platform participants interact with each other via a central platform as an intermediary.

The central platform isolates the platform participants from one another and thus creates dependencies - this results in tendencies toward monopoly formation and consequently also so-called "lock-in effects".



Federated Platform

Federated platforms connect platform participants without isolating them from each other.No intermediary is needed to carry out interactions.

Thus, participants of different sizes can coexist in the long term.





Silicon Economy Target picture

The Silicon Economy wants to make an active and, above all, sustainable contribution to shaping our future economic system.



Collaborative, continuous open source development of solutions and/or business models in logistics of high quality and integrability.

Enabling rapid market entry for all industry players with innovative solutions, transparency and low barriers to entry.

The community is topic-oriented and independently organized. The community continuously develops components and enables new fields of application by feeding back innovative solutions to the Silicon Economy.



Silicon Economy Open Source Development



Open Source Software (OSS) is...

- Software released under a permissive open source license
- OSS is part of many software products
 - Well-known examples:
 Linux
 MySQL
- An open source license grants the right
 - to use the software freely
 - to access and modify the source code
 - to distribute the software

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Advantages of Open Source:

Potential for participation also by non-software companies

- Reduction of (development) costs
- High code quality through transparency
- Improved results through consensual development ecosystems

Why open source makes sense for eCMR **Conserving resources** Logistic standard **Universal document** Compatibility CMR is not a unique A common basis for all Standard for digitized Shared IT resources for selling proposition organizations transport information digitization



Silicon Economy

CMR as paper-based document The CMR protocol





- Agreement on the Contract for the International Carriage of Goods by Road.
- Signed on 19 May 1956
- Applicability of the Convention to any international carriage of goods by road by means of vehicles
- Compulsory issuance of three original copies (consignor's, carrier's, consignee's)
- Optional issuance of an official copy
- CMR member states (58*) have agreed on the document



CMR Protokoll (1956): <u>https://unece.org/fileadmin/DAM/trans/conventn/cmr_e.pdf</u>

CMR as paper-based document **Functions of the CMR**





Contract of Carriage in International Cross-Border Road Transport

Information for carriers and authorities

Evidence for basic characteristics of a transport



CMR as paper-based document Known CMR layouts





numerous individualisations





CMR as paper-based document Current practice in the supply chain





- Bill of lading is a document proving the conclusion and content of a freight contract, highly relevant for customs, police and invoicing.
- There is no standard process for the bill of lading (procedure strongly depends on the customer's specifications).

- Numerous variations in layout and handling
- High effort for manual search processes and administrative management
- Work-arounds are common for digitization (e-mailing of scans)



Electronic CMR (eCMR)

What is the eCMR?

- Digital variant of the paper-based CMR
- Regulation of the digital CMR in the eCMR Additional Protocol (published in 2008)
- The eCMR Additional Protocol must be legally approved at national level.
- After that, the digital document is legally equivalent to the paper-based consignment note.
- On April 5, 2022, the eCMR Additional Protocol will come into force in Germany.
- Country-specific implementation has so far been carried out by 33* countries

Functional requirements through the eCMR additional protocol:

- Secure electronic signature (authentication)
- Integrity of the data as soon as the consignment note is available in its final form
- Integrity is given if the information is complete and unchanged
- Additions and changes to the document can be identified (change history)

Procedures and methods for implementing the technical requirements are not described in the eCMR protocol.



eCMR additional protocol: <u>https://unece.org/DAM/trans/conventn/e-CMRe.pdf</u>



Electronic CMR (eCMR) Ratification of the eCMR Protocol

CMR Member States	eCMR Member States
58	33

CMR Member States & eCMR Accession or Ratification

CMR Member State

Kein CMR Member State



Electronic CMR (eCMR) Added value of the paperless eCMR





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eCMR in the Silicon Economy **Overview of the basic functionalities**



Project overview

- Web-based application for generating, storing & sharing digital waybills
 - CMR layout based on IRU template
 - Manual or automated creation (interface) of eCMRs
 - Storage of waybill according to UN/CEFACT data standard
 - Forwarding function via QR code and address book
 - Traceability of changes through version history
 - Responsive design: Usable for stationary and mobile devices
- Signature by digital signature "Advanced level" according to EU eIDAS regulation.
- Blockchain interaction: writing and validation of hash values



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eCMR in the Silicon Economy The four protection goals

Confidentiality

Transport information: This may only be read or modified by authorized users Rights and role management

Integrity

Data must not be changed unnoticed. All changes must be traceable. Documentation of all edits in version history

Authenticity

Authenticity, verifiability and trustworthiness of the data Authenticity of documents can be

verified using blockchain hashes

Accountability

An action performed can be clearly assigned to a communication partner Digital signature procedure documentation of tokens and public keys





eCMR in the Silicon Economy Validation using blockchain technology



Purpose

- The hash value (verification value) & ID of a waybill is stored on the blockchain
- Matching of hash values ensures integrity of transport information
- Operation of a blockchain for all instances

Method

- Consortial blockchain where everyone (full node) has the same rights (write, read, blockchain identities).
- Companies can operate network (full node) or only participate (light clients)
- Proof-of-Stake variant(Very low power).

Technology

- Tendermint blockchain as a Cosmos implementation.
- Necessary equipmentFull Node:
 - server infrastructure
 - Light Client:REST interfaces

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eCMR in the Silicon Economy Forwarding functions







eCMR in the Silicon Economy

Digital signature

Legal framework



Technical implementation

Hash method: SHA-256

- Recommendation of the SOGIS-IS Crypto Working Group
- State of the art and good compromise between data economy and security

Signature method: Asymmetric, ECDSA

- State of the art
- Compact keys and high security

Implementation of implicit and explicit signature

eCMR in the Silicon Economy Challenges with open source eCMR

Registration

Digital Signatur

Language barriers

User friendliness

Decentralized architecture

Internet access

No standard process

eCMR in the Silicon Economy

Abilities of a single instance

- Web-based application for generation, storage & sharing of digital waybills
- Administration of users
- Configuration of user roles (e.g. dispatcher, driver, etc), e.g.
 - Configuration of mandatory fields
 - Configuration of locked fields
- Customization of the user interface possible
- Modular addition of further services, e.g.
 - Interface for file import
 - Validation via block chain

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eCMR in the Silicon Economy

Exchange of information across multiple instances

eCMR in der Silicon Economy

Information-carrying instance with local copies

- The creator instance of the eCMR is the information-bearing instance
- Participating instances receive a copy of the eCMR
- Users of other instances use their own frontend and backend
- Changes to the eCMR are communicated to the information leading instance
- Information bearing instance distributes the update

eCMR in the Silicon Economy Challenges for a decentralized architecture

eCMR in the Silicon Economy

Used templates, standards & recommendations

- CMR Layout template IRU (2007): <u>Link</u>
- eCMR UN CEFACT Data-standard: Link
- Digital signature advanced level according to EU eIDAS regulation (Link)
 - Implementation according to the recommendation of the SOGIS-IS Crypto Working Group(Link)
 - Hash value calculation: SHA-256
 - Signature method: Elliptic Curve Digital Signature Algorithm (ECDSA)
- Procedure for decentralized generation of eCMR IDs: UUID V4 (Link)
- Interface: REST API for automatic generation of eCMRs (Link)

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eCMR in the Silicon Economy

Login

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	dana@disponent.de	
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Create a new eCMR

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Share eCMR

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All Contacts...

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eFTI - Electronic Freight Transport Information Overview

Regulative

- The eFTI Regulation (2020/1056) was published in the Official Journal of the EU on 31.07.2020 and entered into force on 20.08.2020 - It will apply in all Member States from 21 August 2024
- It is intended to enable companies in Europe on a voluntary basis to provide legally required freight transport information for transport within the EU by electronic means (B2A)
- It should also be possible to map processes between companies in the logistics chain (B2B)

Operational

- The information should be digitally retrievable during transport (pull mechanism)
- Data should be made available digitally only once for different purposes of use
- Today's paper documents are not simply to be converted into "digitised documents", but machine-readable data records are to be stored
- Implementation planned from 2024

eFTI - Electronic Freight Transport Information Possible technical structure of the eFTI network

NAP = National Access Point 1x per country - this is used to regulate access to the eFTI-Data and -Platforms

AP = Access Point

Are operated by competent authorities

EO = Economic Operator Economic participant

eFTI-Data and –Platforms

eFTI-Data is exchanged via eFTI-Platforms. These are operated by companies (self-hosted or offered via service providers) and can be viewed or accessed by authorities

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eCMR in the Silicon Economy From prototype to open source product

Silicon Economy project

- Development of basic functionality
- Architecture and Standardisation
- Common components and functions

Open Logistics Foundation

- Provision of open source code
- Clarification in Working Group
- Extension of functional scope

Industrial product development

- Product maturity
- Customizing and multi-language
- Operation of an eCMR service and user support

eCMR in the Silicon Economy

Participation for companies

- The code stored in the Open Logistics Foundation enables an independent instance to be set up
- Instances are operated independently
- Associations or software service providers could provide service for SMEs
- Joint further development of the open source code for the benefit of all
- Open Logistics Foundation provides software repository

eCMR in the Silicon Economy

Participation for companies

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open logistics foundation

The Future of Logistics is Open Source

The Open Logistics Foundation pursues the following goals

- Operation of an open and neutral platform for the joint development of open source software and hardware,
- Free publication of open source software and hardware,
- Establishment and maintenance of an open source community,
- Merging results from science, applied research and practice into practical open-source applications,
- Development and establishment of software and/or hardware de-facto standards,
- Implementation of scientific projects for the development of free open-source software and/or opensource hardware,
- Networking of people and companies with relevant know-how, organising events as well as supporting further education and training in the field of digitalisation.

Joint developments as a solution to existing problems

- New technologies and innovative business models based on digital platforms are putting established logistics companies under increasing pressure.
 - > How can digitalisation be driven forward without losing one's own sovereignty?
- Logistics connects numerous industries and domains with each other, each with its own standards and evolved system structures.
 - > How can interfaces and dependencies be reduced?
- No company in logistics has sufficient motivation, market power or resources to implement the necessary components and standards on its own.
 - > Can joint developments help and how can they be tackled?
- Major advances in social issues such as sustainability and emission reduction can basically only be achieved through cooperation.

Open Logistics Foundation Working Group Electronic Transport Documents

- Shipping documents are still mostly paperwork nowadays
- Goal of the Working Group:
 - Establish a standardised procedure of creating, editing, saving, forwarding, and archiving these documents
 - Develop a solution for companies to handle all kinds of shipping documents in a uniform manner
- Group's first project: Open Source eCMR
 - Weekly meeting with members of the Working Group
 - Website of the Working Group: Link

Further Informationen Links

Website Silicon Economy <u>https://www.silicon-economy.com/</u>

- Website Open Logistics Foundation <u>https://openlogisticsfoundation.org/</u>
- Press release on the open source publication <u>https://www.iml.fraunhofer.de/de/presse_medien/pressemitteilungen/open-source-repository.html</u>
- Open Source GitLab <u>https://git.openlogisticsfoundation.org/public</u>
- Video <u>https://youtu.be/LopEhyAxdp4</u>

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