Digital Data Marketplaces

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Ideas and concepts developed by Cees de Laat, Leon Gommans, Tom van Engers, Paola Grosso and others
Our goal:
Enabling secure, trustworthy data exchange for public (e.g. science, healthcare) and private interests (e.g. improved services, efficiency, compliance) in which parties retain control over their assets (sovereignty) and regulations are enforced

A European strategy for data, EU commission, COM(2020) 66 final:
The aim is to create a single European data space – a genuine single market for data, open to data from across the world – where personal as well as non-personal data, including sensitive business data are secure ...

Observations:
• EU strives for a digital single market (evidenced by EU data strategy and funding priorities)
• EU strives for the digital sovereignty of its citizens (GDPR for privacy protection, regulations on AI)
• Tension between the above when personal data is used or when data is used by autonomous systems
• Data exchange considered high-risk: lack of trust between organizations, compliance concerns
SSPDDP - Secure Scalable Policy-enforced Distributed Data Processing

Enabling Personalized Interventions

Amsterdam Data Exchange (AMdEX)

Consortium development

Data Market

COMMON BENEFIT
Define and agree common benefit

GROUP RULES
Define consortium rules

ORGANIZE TRUST
Organize trust as a means to reduce risk

IMPLEMENT
Operationalization of Digital Data Marketplace
DIGITAL DATA MARKETPLACE RESEARCH

NORMATIVE SYSTEM BASED AUTOMATION TO CONTROL A S/W DEFINABLE DATA EXCHANGE INFRASTRUCTURE

Digital Data Marketplace Membership organization (e.g. a Consortium)

National Law & Regulations

Market rules

Member admission

Automation during establishment

Agreement

Automation during execution

Registry

Centralized Distributed Federated

Infrastructure Archetype

Software Definable Data Exchange Infrastructure

Data Science Transaction

Global Data Exchange Infrastructure

Algorithm Developer

Data supplier(s)

Ex-post Automation

Dispute Resolution

Accounting & Auditing
Scientific impact

• Network and infrastructure
  • Distributed data processing pipelines (*Baranowski et al. 2020, Cushing et al. 2020*)
  • Multi-domain networking and auditability (*Zhou and Cushing et al. 2020*)
  • Profiling ML applications (*Zhang et al. 2021*)
  • Programmable infrastructure (*Alsayed Kassem et al. 2020*)

• Normative control in distributed and autonomous systems
  • Formal representation of laws and regulations (*Van Doesburg et al. 2019, Van Binsbergen et al. 2020*)
  • Monitoring and enforcement (*Sileno et al. 2020, Van Binsbergen et al. 2021*)
  • Digital enforceable contracts (*Liu et al. 2020*)

Building towards **programmable network infrastructures** that provide the communication, monitoring, and enforcement capabilities **to execute data exchange transactions** compliant with **laws, regulations and agreements** (such as contracts and consortium agreements) and offering **transparency** and **accountability**
Impact

Digital Data Marketplaces (DDMs)

The Nokia Data Marketplace Solution at Equinix

Special Section proposal

• Discuss the ambitions of the EU regarding data economy (EU strategy for data, 2020), the tension with existing and novel regulations (GDPR 2016/2018, forthcoming regulations on AI), and other (technological and organizational) challenges towards the realization of data sharing consortia.

• Detail our vision on digital data marketplaces, discussing how it addresses the aforementioned challenges and the (scientific) impact of the concept.

• Describe research directions preparing data exchange systems for a future with increased integration of AI/autonomous components and additional regulations across jurisdictions.
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EXAMPLE: FEDERATED LEARNING BASED DDM CONSORTIUM NORM DEVELOPMENT USING DATA SHARING COALITION TRUST FRAMEWORK

Digital Data Marketplace

Data owners
https://dl4ld.nl

https://datasharingcoalition.eu
DIGITAL DATA MARKETPLACE GOVERNANCE
A FOUR STEP APPROACH

COMMON BENEFIT
Define and agree common benefit no single organization can achieve on its own and transcend self-interest.

GROUP RULES
Define consortium rules considering data use, access and benefit sharing.

ORGANIZE TRUST
Organize power and trust as a means to reduce risk for participating members.

IMPLEMENT INFRASTRUCTURE
Research operationalization of Digital Data Marketplace & Data Exchange concepts.

How norms can automate