

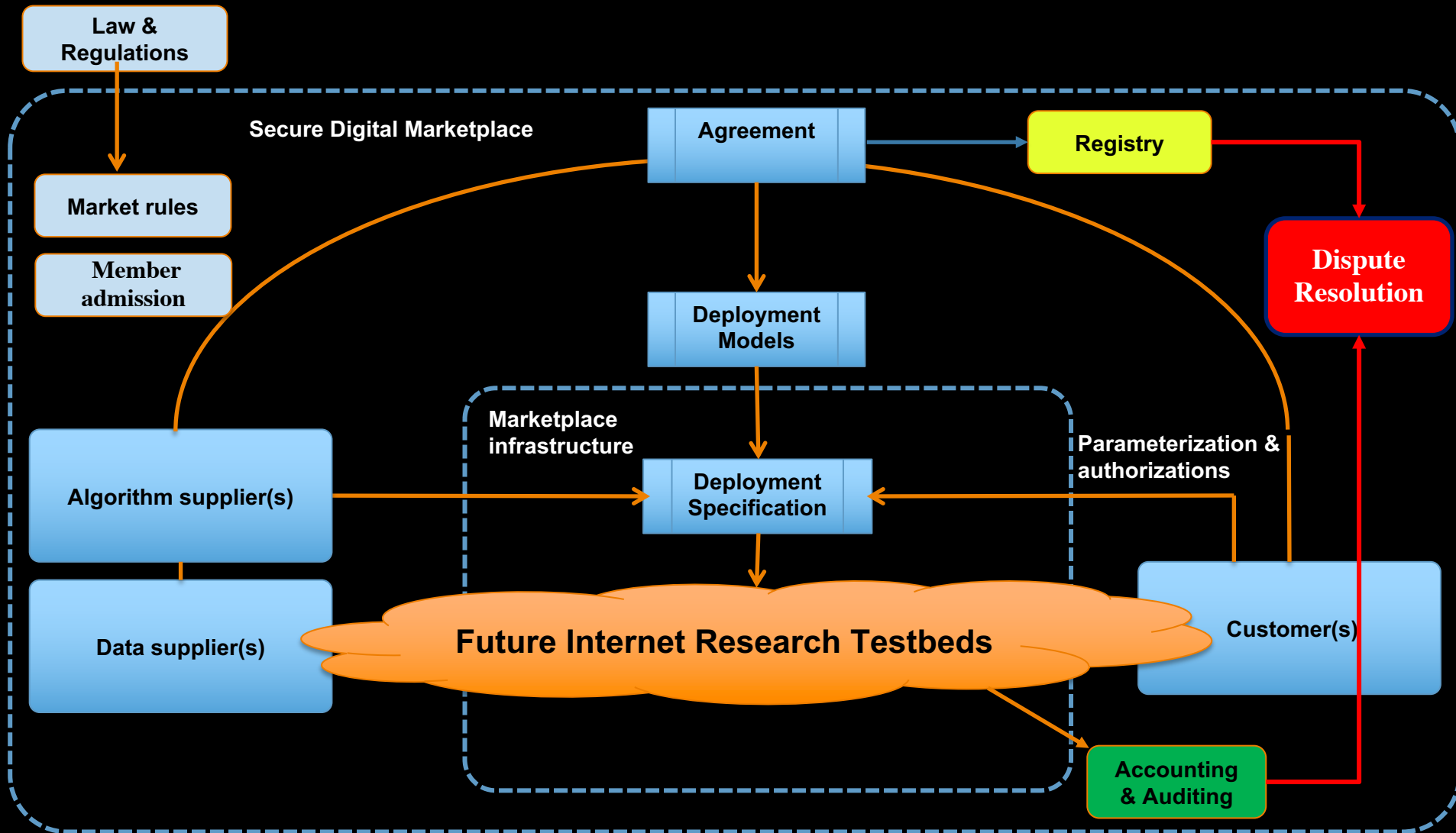
Data Logistics 4 Logistics Data (dl4ld)

Research status

Cees de Laat



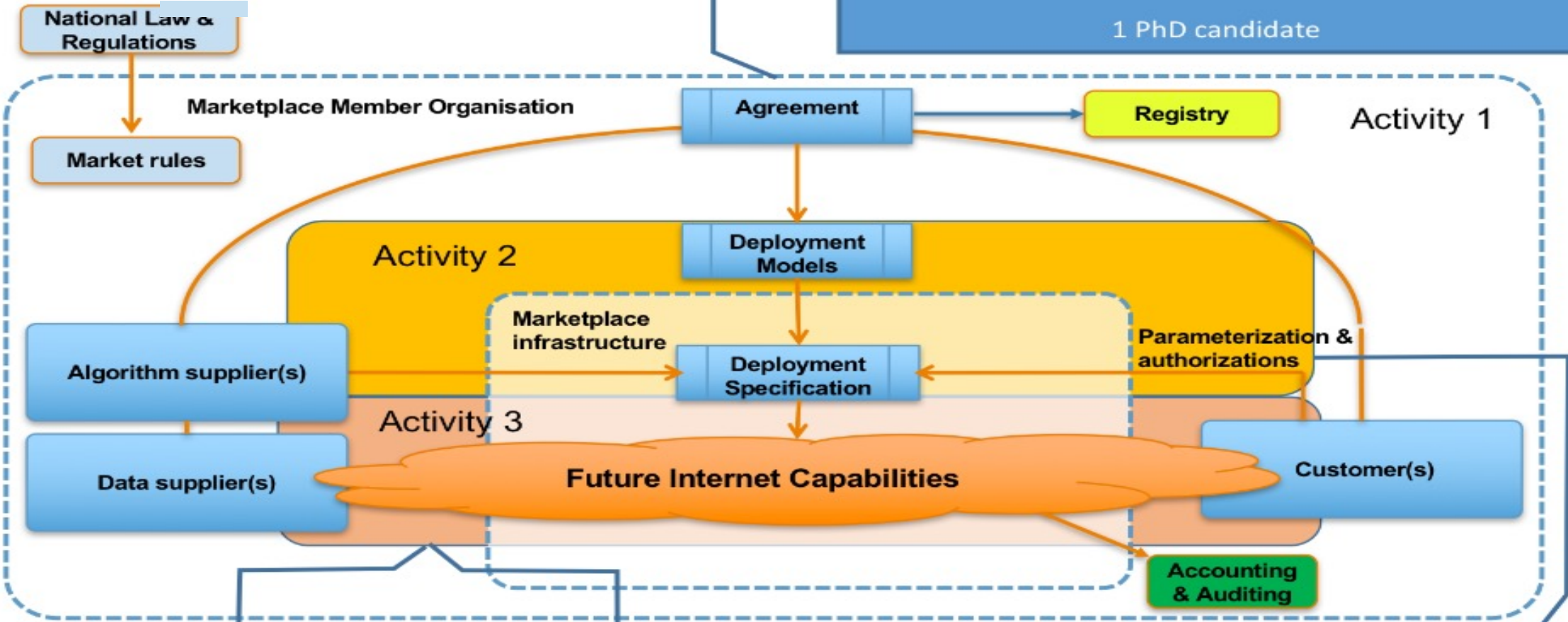
Secure Digital Market Place Research



WP2 Research activity layout and staff involvement

CDL: Cees de Laat
 TVE: Tom van Engers
 SK: Sander Klous
 PG: Paola Grosso
 LG: Leon Gommans

TVE: Digital business agreement negotiation & trust.
 LG: Architecture driven deployment of trusted systems
 SK: Inter-organizational solution development
 1 PhD candidate



Amsterdam Datahub
 SK: Inter-organization service quality & consistency in practice
 1 PhD candidate

Openlab, KLM, Ciena, GLIF
 CDL: Multidomain aspects
 PG: Infra programmability
 LG: Programmable component deployment
 1 Prgmr
 1 PhD candidate

TVE: Digital realization of trust
 LG: Creating archetypes of deployment models.
 PG: Semantic composition of services
 CDL: Forward looking architectures
 1 Postdoc researcher



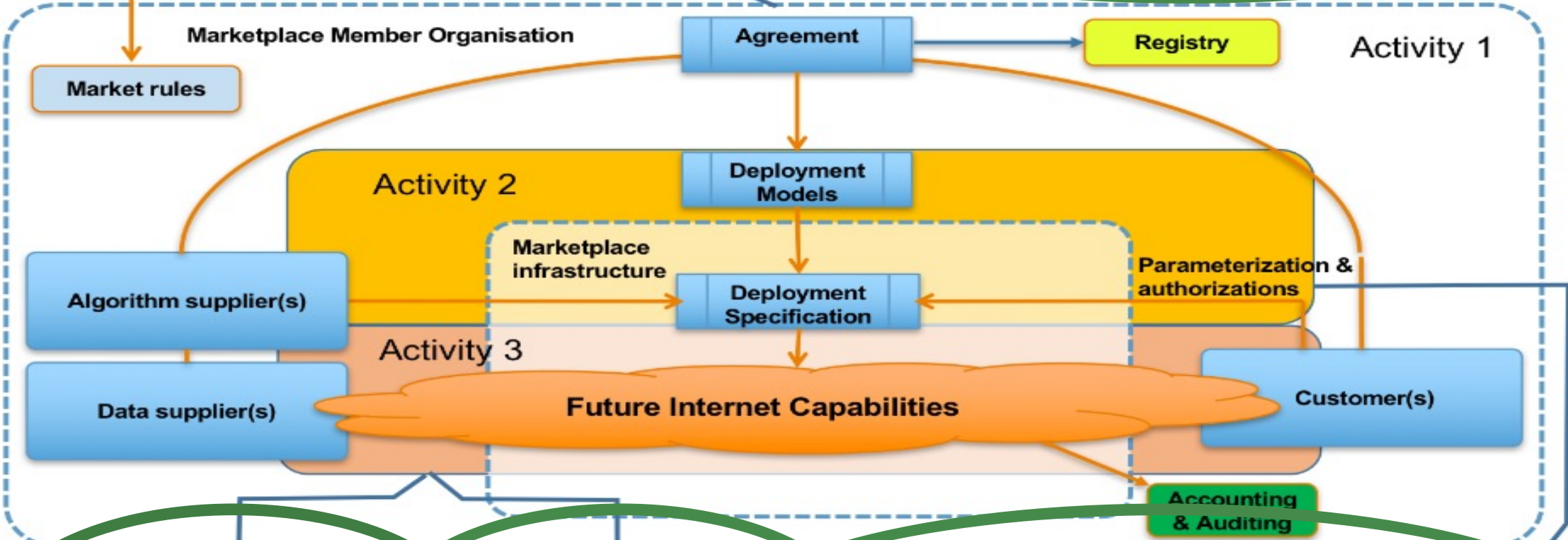
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National Law & Regulations



Amsterdam Datahub
 SK: Inter-organization service quality & consistency in practice

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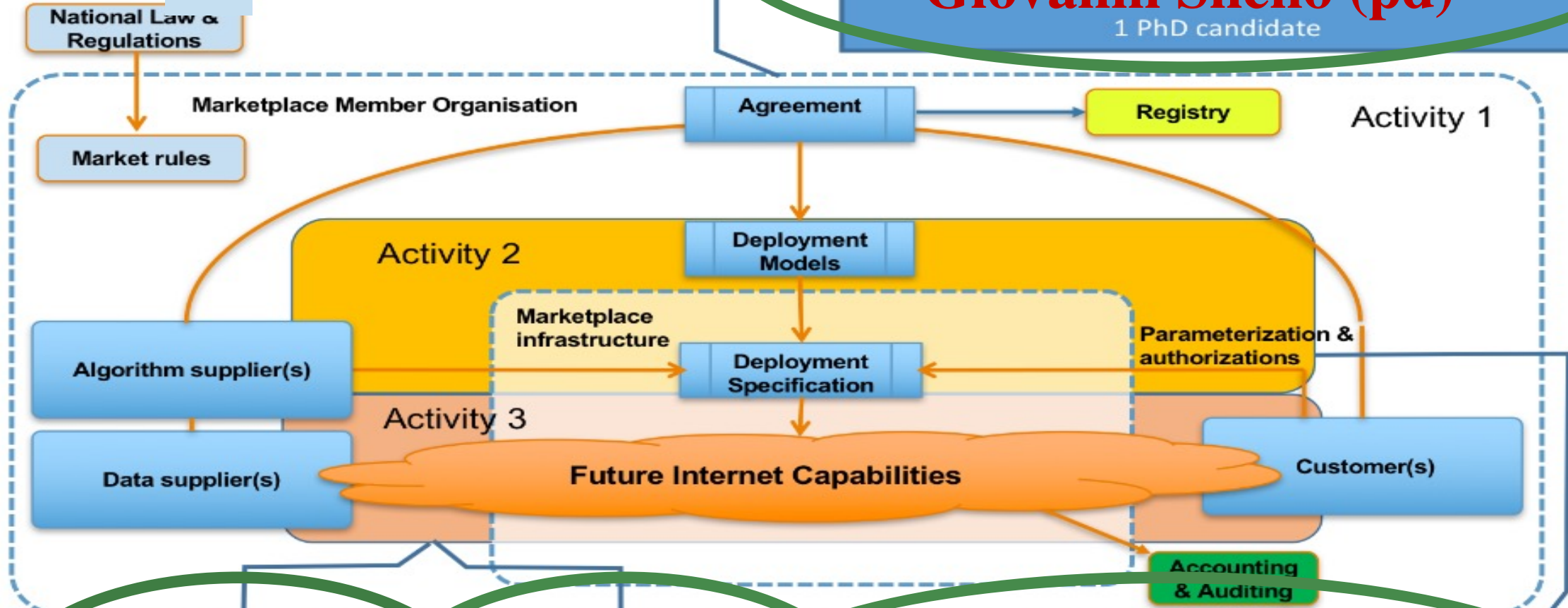
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Mostafa Parizi
Giovanni Sileno (pd)
1 PhD candidate



Amszrlam Qitubuh
SK: Inter-organizational
service quality &
consistency in practice
1 PhD candidate

Ope...lah, KZ...Ciena, GUI...
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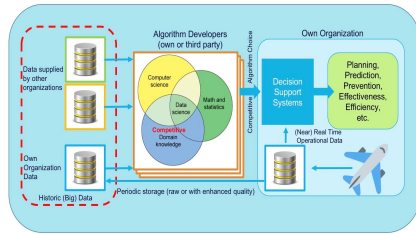
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Training AI/ML models using Digital Data Marketplaces

Creating value and competition by enabling access to additional big data owned by multiple organizations in a trusted, fair and economic way

The more data - the better: an aircraft maintenance use-case



- AI/ML algorithm based Decision Support Systems create business value by supporting real-time complex decision taking such as **predicting the need for aircraft maintenance.**

- Algorithm quality increases with the availability of aircraft data.

- Multiple airlines operate the same type of aircraft.

- **Research Question:** "How can AI/ML algorithm developers be enabled to access additional data from multiple airlines?"

- **Approach:** Applying Digital Data Marketplace concepts to facilitate trusted big data sharing for a particular purpose.

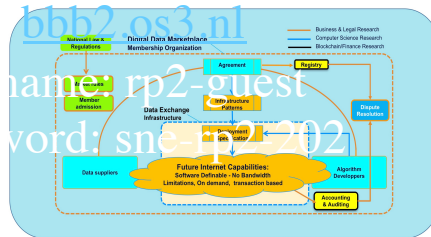
Digital Data Marketplace enabling data sharing and competition

A **Digital Data Marketplace** is a membership organization supporting a common goal: e.g. *enable data sharing to increase value and competitiveness of AI/ML algorithms.*

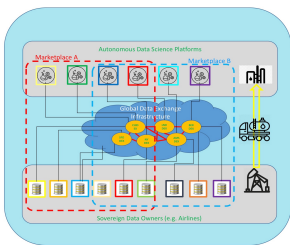
Membership organization is institutionalized to create, implement and enforce membership rules organizing **trust**.

Market members arrange **digital agreements** to exchange data for a **particular purpose** under specific conditions.

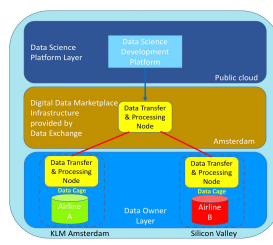
Agreements subsequently drive data science transactions creating processing infrastructures using infrastructure patterns offered by a Data Exchange as **Exchange Patterns**.



Researching Exchange Patterns to support Digital Data Marketplaces



Data Exchange Model



Research Infrastructure

- Trust Modelling:** What is the optimal infrastructure topology, describing storage and processing locations and their relationships, which best suit member requirements when considering risk?
- Processing Models:** What are the implications of distributing data processing across membership organization owned infrastructures in terms of achievable model accuracy and processing performance using federated/distributed models vs centralized models?
- Marketplace Reference Architecture:** What constitutes a marketplace? Researching needed functions, personas, flows, standards, contracts & rules, conflict resolution, and much more ...

Research Elements



Leon Gommons, Anne Savelkou, Wouter Kalfsbeek, Dirk van den Herik, David Langerveld, Erik Uzermans, Floris Freeman, Brend Dijkers, Cees de Laat, Tom van Engers, Wouter Los, Paola Grosso, Joseph Hill, Reggie Cushing, Giovanni Sileno, Lu Zhang, Amesh Delpoo, Thomas Baeck, Willem Koeman, Laurie Strom, Axel Berg, Gerben van Malenstein, Kaladhur Voruganti, Rodney Wilson, Patricia Floris

<http://delaat.net/sc>

Nov 11-16, Dallas (TX), CIENA booth 2847 SURF booth 2041

2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
Phoenix Pittsburgh Seattle Tampa Reno Austin Portland New Orleans Salt Lake City Denver New Austin Salt Lake City Denver Dallas Denver

No more webinars due to the EU GDPR regulation of:

AIR FRANCE KLM TRANSFLIGHTS evofenedex ciená Bizdesign
DATADIGEST ORACLE THALES SCinet

SC2018 Workshop and Technical program presentations & involvement by UvA group members:

- INDS18 workshop organized by Paola Grosso, Mary Heister, Michelle Zhu and Ilya Haidin.
 - Presentation by Network for Data Intensive Science (NDIS)
 - Date: Sunday, November 11, 2018, Time: 09:00 - 17:30 at the Key Bailey Haskins Convention Center, Dallas, TX.
 - Conference topics in IEEE terminology:
 - INDS18 presentation/paper by Joseph Hill (speaker), Paola Grosso: "Tracking network flows with P4".
 - presentation
 - INDS18 presentation/paper by Amesh Delpoo, Tom van Engers, Leon Comman, Cees de Laat (speaker): "Social Computational Trust Model (SCTM): A Framework to Facilitate the Selection of Partners".
 - presentation
 - INDS18 "8th Workshop on Tangible Applications: Architectures and Algorithms" presentation by Merijn Elvin Versmaam (speaker), Ana Luisa Vahnestras and Cees de Laat: "Mix and Match: A Model-Driven Runtime Optimization Strategy for BFS on GPUs".
 - presentation
- Data Harbours: A compute infrastructure for data marketplaces.
- Building User-Friendly Data Transfer Nodes.
- Training AI/ML models using Digital Data Marketplaces.
- Dynamic infrastructure planning and provisioning for time-critical applications in clouds.

Impressions:

- VLOG by Herold Thunnissen (SURF)

Digital Market Places

Data Harbours

Data Harbours: A compute infrastructure for data marketplaces.

Building User-Friendly Data Transfer Nodes

Building User-Friendly Data Transfer Nodes

Building User-Friendly Data Transfer Nodes

SCinet contributions from Holland

ENXVPL Plan

Dynamic infrastructure planning and provisioning for time-critical applications in clouds.

Team members:

- UvA
 - J.P. Welden, Embedded Routerheads
 - Dr. Paola Grosso, Embedded Routerheads
 - Erik Koeman, Student Volunteer
 - Prof. Cees de Laat, UvA
- SURF
 - Pieter de Boer BSc, Routerheads
 - Your team BSc, Routerheads
 - Mary Heister BA, NWO/INDS
- DelftU
 - Cedric Both, Edge and WiFi

Contributions: INDS18 Workshop

SCinet SC18 network map

SURF booth crew

Press abstracts

Data Harbours: A compute infrastructure for data marketplaces.

Reginald Cushing, Tim van Zalingen, Joseph Hill, Paola Grosso, Cees de Laat, Lu Zhang, Leon Comman, Rodney Wilson, Marc Lymann, Vijay Doraiswamy, Purvish Purvish, Kaladhur Voruganti, Cedric Walsberg

Sharing and computing on sensitive data is a challenge. Competing parties have many reasons to be cautious about their data yet there are situations where sharing data between competitors results in a win-win scenario whereby both parties gain an advantage. Under such critical conditions a question that leg to be asked is: how can competing parties share sensitive data while still be secure? This prototype demonstrates such a scenario where competing parties own assets (data and compute) and allow processing under strict policies which define which compute resources which data and where can processing take place. See:

- video
- poster
- SC18 website
- CIENA media release

Building User-Friendly Data Transfer Nodes.

Joseph Hill

Abstract: This demonstration will show how Data Transfer Nodes can be combined with existing applications to provide researchers a familiar interface with the enhanced performance of a DTN. This node and protocol have been modified to utilize a DTN to perform cross-domain transfers. This allows researchers to transfer files to peers across organizations and long distances at high speed without having to interact with a DTN directly.

- video

Training AI/ML models using Digital Data Marketplaces.

Leon Comman, Anne Savelkou, Wouter Kalfsbeek, Dirk van den Herik, David Langerveld, Erik Uzermans, Floris Freeman, Brend Dijkers, Cees de Laat, Tom van Engers, Wouter Los, Paola Grosso, Joseph Hill, Reggie Cushing, Giovanni Sileno, Lu Zhang, Amesh Delpoo, Thomas Baeck, Willem Koeman, Laurie Strom, Axel Berg, Gerben van Malenstein, Kaladhur Voruganti, Rodney Wilson, Patricia Floris

When using your own data, AI can solve problems. When sharing your data, AI can transform industries. This presentation discusses an approach, called the Digital Data Marketplace, allowing consortium members to share their data with other members to achieve benefits with AI on single-organization models achieve on its own. To allow Digital Data Market to be created for many applications including Science, Smart Industry, Logistics, Health, Agriculture and more, we foresee the need to create Data Exchanges that offer common infrastructure capabilities. We will use an aircraft predictive maintenance use-case as an example, where an industry technology consortium could play a key role.

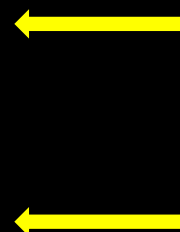
- presentation

Dynamic infrastructure planning and provisioning for time-critical applications in clouds.

Sprine Kozlowski, Paul Martin, Wang Jianchao, Han Zhou, Yang He, Zhiming Zhao.

The Dynamic Real-time Infrastructure Planner (DRIP) is a service suite for planning and provisioning networks of virtual machines and then deploying distributed applications across those

SC2018
<https://delaat.net/sc>

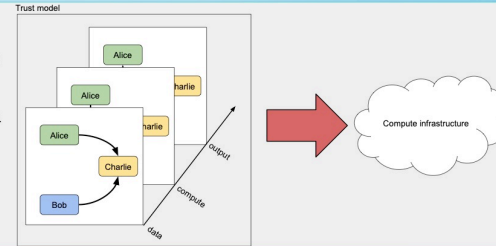


Dataharbours: computing archetypes for digital marketplaces

Reginald Cushing, Lu Zhang, Paola Grosso, Tim van Zalingen, Joseph Hill, Leon Gommans, Cees de Laat, Vijaay Doraiswamy, Purvish Purohit, Kaladhar Voruganti, Craig Waldrop, Rodney Wilson, Marc Lyonais

The problem

How can competing parties share compute and data? The architecture of a digital marketplace is an active research field and has many components to it. Here we investigate a federated computing platform which is molded into different **archetypes** based on **trust** relationships between organizations.



The components

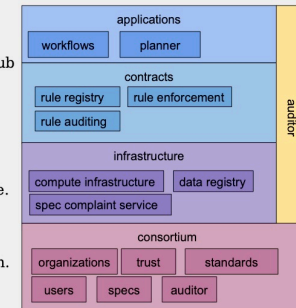
Consortium: is an initial document which brings together organizations that wish to collaborate. It defines static information such as keys to identify parties.

Infrastructure: A single domain organization infrastructure that securely hosts data, compute containers and, optionally, compute infrastructure. We dub this infrastructure a **data harbour**. A harbour implements a set of protocols that allows it to interact with other harbours.

Contracts: Are a set of rules that are shared amongst participating harbours which describe how objects (data, compute) can be traded between harbours and who can process data. In its simplest form is a 7-tuple which binds a user, data object, compute container, contract, consortium, harbour, and expiry date.

An application: Is a distributed pipeline which can make use of several contracts. The combination of application and contract defines the archetype of the computation i.e. how data and compute are moved to effect computation.

Auditor: A trusted entity that collects audit trails for use in litigation of policy violations.

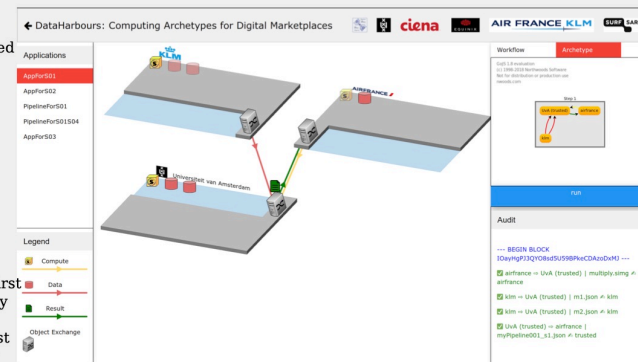


In action

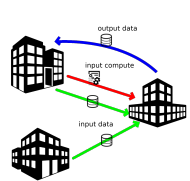
Federated computing on 3 distributed data harbours. Here we illustrate one archetype where KLM and Airfrance do not trust each other and employ a trusted 3rd party to send the data and compute for processing.

For the scenario to succeed the different harbours need to effect several transactions which are governed by contractual rules.

The transaction **protocol** involves first identifying both parties are who they say they are through pub/priv key challenges and secondly, that at least a **contract** rule is matched to allow the transaction. Important steps of the transactions are **audit** logged i.e. signed and published to and audit log collector.

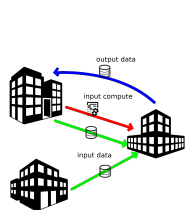


Ralph Koning, Reginald Cushing Lu Zhang, Cees de Laat, Paola Grosso, University of Amsterdam



Competing companies can, together, generate value from collaborating on data and compute. Examples include airlines industry, ports, healthcare.

Clearly this poses a challenge of how to facilitate such collaborations through technology. Here we look at one piece of the puzzle i.e. setting up distributed multi-domain infrastructures between such parties to facilitate the running of applications.

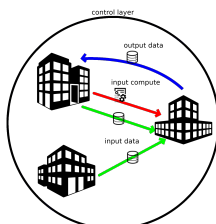


Motivation

- Multi-domain distributed applications need to share data and compute under different policies.

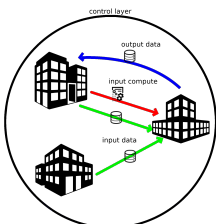
Challenges

- Map data sharing policies to infrastructure.
- Build an infrastructure that facilitates these applications.
- Control sharing of data and compute.
- Audit activity of the network.
- Minimize risk of policy/security breaches.



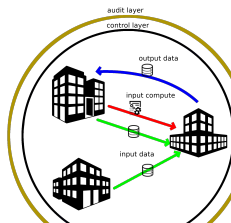
Overlay

- Nodes on the network are addressed using their public key.
- Nodes include: domain controllers, data buckets, auditors, application planners, users.
- Keys create chains of trust and verification through cryptographic signature trails.
- Applications are decomposed to a set of transactions.
- Transactions drive the overlay.



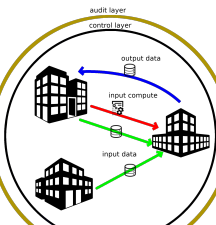
Control functions

- Securing bucket-to-bucket communication through transaction specific VPNs.
- Bucket node key address used as VPN keys.
- Opening connection endpoints on audit signatures.
- Network interfaces created on demand. Bucket containers have no network interface. Interfaces are only created and attached per signed transaction.



Network of Auditors

- Auditor nodes on the network provide a signing and verification layer that is checked by the control layer.
- Auditors sign network actions based on their internal policy.
- Auditors are independent of each other.
- The more number of signatures an action gets (e.g. transaction) the more confident the control layer is.
- Auditors cross-verify each other's logs to minimize log tempering.



In short..

- Overlay allows for a distributed infrastructure.
- Key-based addressing allows for node signature trails and trust chains.
- Network of auditors provide *rubber-stamping* of actions/transactions
- Control layer enforces security using inputs from auditors and minimizes attack vectors on data transfers.

Proof of Concept, see <https://d14ld.nl/>

The screenshot shows a 'world-app' interface. On the left, a diagram illustrates a transaction flow between three buildings. In the center, a table lists 'Audit Transactions' with columns for ID, Source, Destination, and Status. On the right, a circular network diagram shows nodes and connections. Below the table, there are 'Actions' and 'Status' sections with detailed logs.

This research is funded by the Dutch Science Foundation in the Commit2Data program (grant no: 628.001.001) and by Equinix.



The screenshot shows the SC19 workshop and technical program page. It includes a navigation bar with 'SC19: Nov 17-22, Denver (CO); CIENA booth 943 and SURF booth 1963'. Below the navigation bar, there are logos for various sponsors like CIENA, THALES, TRANSFIDES, and ORACLE. The main content area lists workshop and technical program presentations, including 'Innovating the Network for Data Intensive Science (INDIS) workshop' and 'Technical Challenge Award Ceremony'. There are also images of the workshop and technical program presentations.

The screenshot shows a 'Demo abstracts' page. It includes a section for 'Secure network overlay for tracking and enforcement of data transaction rules' with an abstract and a list of authors. Below that, there is a section for 'User Friendly Data Transfers with DTNs' with an abstract and a list of authors. The page also includes a list of notification signals and a section for '25TIC: Security, stability and transparency of inter-network communications'.

25TIC: Security, stability and transparency of inter-network communications. AMES-DC, NWO Labs, S&E Labs, SURFnet, TU Delft, the University of Amsterdam and the University of Twente work together in the joint research programme called 25TIC (pronounced 'to-stick'), which is short for Security, Stability and Transparency in Inter-network Communications. 25TIC's goal is to develop and evaluate mechanisms for increasing the security, stability and transparency of Internet communications, for instance by experimenting with and contributing to emerging internet architectures, such as SCION, RINA, and NDN, as well as the existing (IP-based) Internet. The 25TIC partners envisage that such new types of Internet will complement and co-exist with the current Internet, and/or specific types of applications. Our procedures objective is to establish a process of cooperation in the field of enabled next-generation protocols and below the P4 level to extend the

SC2019 <https://delaat.net/sc>



ICT-OPEN 2020-2021

Agent-Oriented Programming for Modern Cyber-Infrastructures

Mostafa Mohajeri Parizi, Giovanni Sileno and Tom van Engers, UvA, Complex Cyber Infrastructures (CCI) group

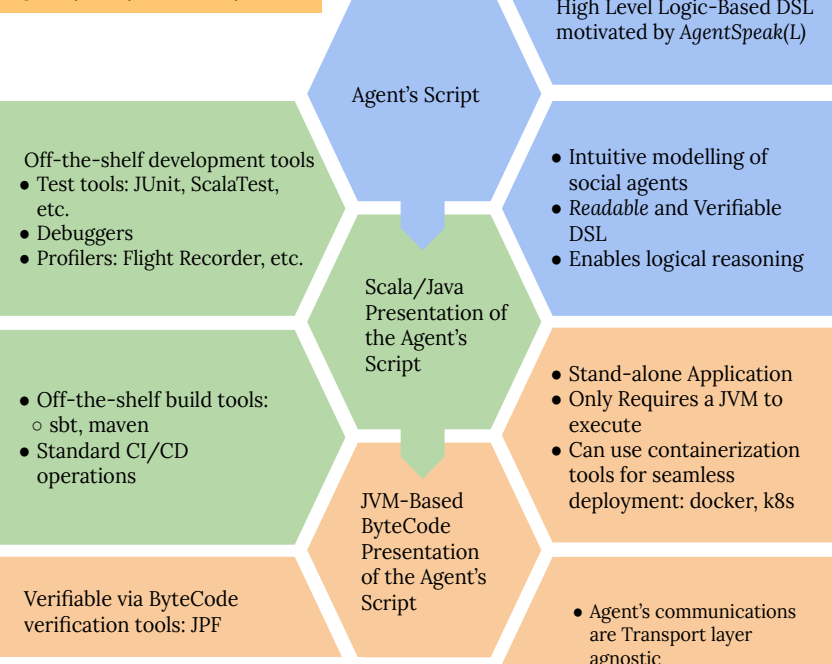
Introduction

- Importance of data in all domains of human activity has brought the requirement for more complex data-sharing Cyber-Infrastructures.
- These Infrastructures exhibit the double status of *computational* and *social* systems and regulating them requires higher level reasoning.
- Agent Oriented Programming (AOP) is extensively studied and used for modeling and simulation of social systems.
- The AgentScript Cross-Compiler (ASC) is built to bridge the modelling power of AOP with operational requirements of modern Complex Cyber-Infrastructures

Summary

- This work introduces AgentScript Cross-Compiler (ASC):
- Provides a high level DSL agent programming language
- A Cross-Compiler to translate the Agent DSL into executable code.
- Allows use of modern development tools such as Testing, Debugging and Profiling.
- Enables seamless deployment into modern infrastructures with minimum runtime dependencies and transport-layer agnostic communication.

AgentScript's Compile, Build and Deploy Process



Acknowledgments
 This work results from work done within Data Logistics for Logistics Data project (DL4LD, www.dl4ld.net). The DL4LD is funded by the Dutch Science Foundation in the Commit2Data program (grant no: 628.001.001).

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Logos: TKI DIALGO, THALES, AIRFRANCE KLM, evofenedex, ciena, TRANSFIDES, ORACLE, Gemeente Amsterdam, NWO, CWI, Vrije Universiteit Amsterdam, ING, ABN-AMRO

Digital Enforceable Contracts (DEC): Making Smart Contracts Smarter

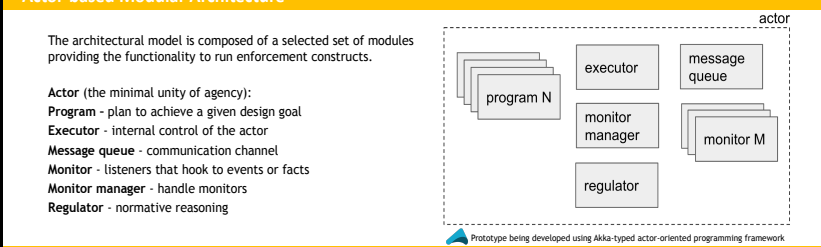
Lu-Chi Liu, Giovanni Sileno, Tom van Engers
 Complex Cyber Infrastructure Group, Informatics Institute, University of Amsterdam

Background

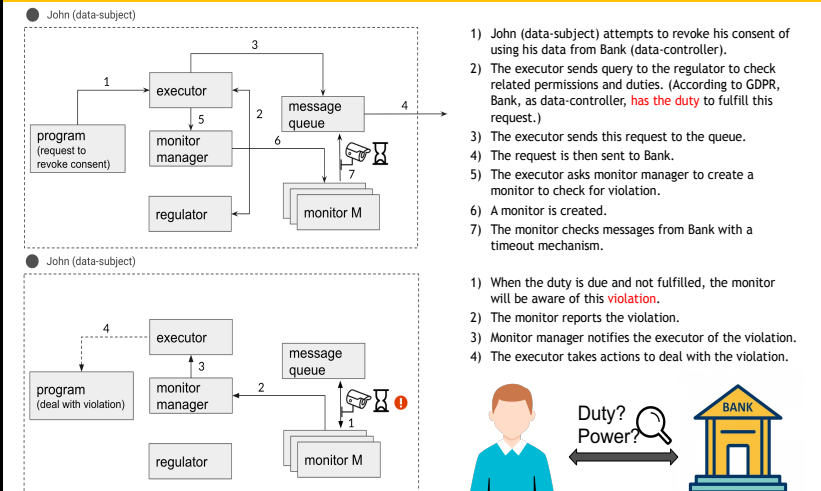
- Current smart contracts have limited capabilities of normative representations, making them distant from actual contracts.
 - Normative contents (duty and power) can be modeled into logic-based representation.
 - DEC provides a general architecture where various enforcement mechanisms are enabled by normative reasoning. For example, to check whether an action will lead to a duty.
- ```
// written in eFLINT
Act request to modify consent
Actor subject
Recipient controller
Related to consent, other purpose
Conditioned by
 consent && consent.purpose != other purpose
Creates duty to modify consent()

Duty duty to modify consent
Holder controller
Claimant subject
Related to consent, other purpose
```
- Norms related to GDPR

### Actor-based Modular Architecture



### Example: A Data-sharing Scenario with GDPR



Acknowledgments: This research is funded by the Dutch Organization for Scientific Research (NWO) under contracts 628.009.014 (SPQDP project) and 628.001.001 (DL4LD project).

References:  
 [1] Lu-Chi Liu, Giovanni Sileno, and Tom van Engers. Digital enforceable contracts: making smart contracts smarter. JURIX, 2020.  
 [2] L. Thomas van Breda, Lu-Chi Liu, Robert van Doornik, and Tom van Engers. eFLINT: a domain-specific language for enforceable norms specifications. In Proceedings of DEFT '20, IC3A, 2020.

Logos: NWO, CWI, Vrije Universiteit Amsterdam, ING, ABN-AMRO

## POLICY ENFORCEMENT FOR SECURE AND TRUSTWORTHY DATA SHARING IN MULTI-DOMAIN INFRASTRUCTURES

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January 31, 2021

### 1 Abstract

The push for data sharing and data processing across organisational boundaries creates challenges at many levels of the software stack. Data sharing and processing rely on the participating parties agreeing on the permitted operations and expressing them into actionable contracts and policies. Converting these contracts and policies into an operational infrastructure is still a matter of research. In this paper, we investigate the architecture of a multi-domain distributed architecture for policy driven application. The architecture spans components from auditing policies to managing network connections.

The architecture is based on an auditable secure network overlays[3] proposed by Cushing et al. in 2020, the overlays have already introduced an audit layer and a control layer. The audit layer aims at checking if a certain data process is compliant, only those compliant ones can collect signatures, and forwarded to the control layer for further processing, such a mechanism ensures that all operations are audited before execution. This process is shown as fig 1:

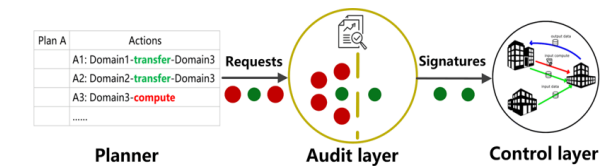


Figure 1: Auditable network overlays: the audit layer aims at checking the requests sent by a planner, only those compliant requests can receive signatures, and then being further executed in the control layer

To enforce the policies by the audit overlay, the unstructured or semi-structured policies expressed in natural language need to be structured and formalized first, before it can be used as input to the audit overlay and combined with the environment conditions (such as region, risk level, etc.) that clarify which policies should be applied. Fig 2 presents the conceptual view of the policy which contain authorisations, obligations, and environmental conditions [4, 2].

<sup>1</sup>This research is funded by the Dutch Science Foundation in Commit2Data program (grant no: 628.001.001).

delaat.net/sc/sc20/index.html

SC20: Nov 9-19, Virtual due to the Covid 19

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| 2003<br>Phoenix | 2004<br>Pittsburgh | 2005<br>Seattle | 2006<br>Tampa | 2007<br>Reno | 2008<br>Austin | 2009<br>Portland | 2010<br>New Orleans | 2011<br>Seattle | 2012<br>Salt Lake City | 2013<br>Denver | 2014<br>New Orleans | 2015<br>Austin | 2016<br>Salt Lake City | 2017<br>Denver | 2018<br>Dallas | 2019<br>Denver | 2020<br>Virtual (Atlanta) | 2021<br>St.Louis |
|-----------------|--------------------|-----------------|---------------|--------------|----------------|------------------|---------------------|-----------------|------------------------|----------------|---------------------|----------------|------------------------|----------------|----------------|----------------|---------------------------|------------------|

# SC2020

<https://delaat.net/sc>

SC2020 Workshop and Technical program presentations & Involvement by UvA group members.

- In the **INDIS 2020: The 7th International Workshop on Innovating the Network for Data-Intensive Science.**
  - Presentation "A Brief History of INDIS" by Cees de Laet
    - Video by Cees de Laet
  - Panel Experimental Networks (XNET) moderated by Cees de Laet, Ezra Kissel, Mary Hester.
    - Thursday Nov 12, 11h05-11h55
    - Program:
      - "Panel Introduction: Experimental Networks (XNET)," Cees de Laet (UvA), Ezra Kissel (ESnet)
      - XNET Lightning Talks
        - "The BRIDGES Project - Building a Global Cyber-Infrastructure Canvas Supporting Networked Applications Experimentation and Evolution," Jerry Sobieski (George Mason University), [slides](#)
        - "FABRIC/FAB Deep Dive " Anita Nikolich (University of Illinois at Urbana-Champaign), Ilya Baldin (RENCI)
        - "SAGE: AI at the Edge for Software-defined Wireless Sensors," Pete Beckman (Argonne National Laboratory)
        - "Quantum Networking," Inder Monga (ESnet), [slides](#)
        - "Extending the Research Engineering Network to the Wireless Edge," Andrew Wiedlea (ESnet)
      - Panel Discussion: Experimental Networks (XNET)
  - Paper presentation: "Using P4 and RDMA to collect Telemetry Data.," Rutger Beltman, Silke Knossen, Joseph Hill (presenter), Paola Grosso.
  - paper: [INDIS-2020-UvA-JH-Paper.pdf](#)
  - slides: [INDIS-2020-UvA-JH-Slides.pdf](#)
- SCinet Experimental Networks Session.
  - Friday Nov 13, 10h00 - 14h30, organized and moderated by Ezra Kissel, Mary Hester, Cees de Laet
  - Presentation "Future of CI and the Role of XNet" by Cees de Laet
  - Demonstrator "Policy Auditing in Data Exchange Systems.," by Paola Grosso, Xin Zhou, Reggie Cushing
  - Full program of the XNET session:
 

| time (EST) | Title                                                                                           | Presenters                                    |
|------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------|
| 10:00am    | SCinet Chair – Welcome to SC20                                                                  | Kevin Hayden                                  |
| 10:09am    | XNet Team Bio Slides                                                                            | Ezra Kissel, Cees de Laet, Mary Hester        |
| 10:10am    | NRE Team Bio Slides                                                                             | Davey Wheeler, J.P. Velders                   |
| 10:13am    | INDIS Team Bio Slides                                                                           | Michelle Zhu, Sarah M. Neuwrith, Mariam Kiran |
| 10:15am    | Introductions                                                                                   | Ezra Kissel, Cees de Laet, Mary Hester        |
| 10:20am    | <a href="#">SC20 XNet Overview</a>                                                              | Ezra Kissel                                   |
| 10:31am    | <a href="#">Future of CI and the Role of XNet</a>                                               | Cees de Laet                                  |
| 10:46am    | <a href="#">SAGE: AI at the Edge for Software-Defined Wireless Sensors (INDIS Deep Dive)</a>    | Pete Beckman                                  |
| 11:11am    | <a href="#">Bridges IRNC (INDIS Deep Dive)</a>                                                  | Jerry Sobieski                                |
| 11:36am    | <a href="#">FABRIC/FAB (INDIS Deep Dive)</a>                                                    | Ilya Baldin, Inder Monga, Anita Nikolich      |
| 12:01pm    | XNet Panel with Q&A                                                                             | Ezra Kissel, Cees de Laet, Mary Hester        |
| 12:08pm    | Break                                                                                           |                                               |
| 12:13pm    | <a href="#">ESnet6 High Touch Services</a>                                                      | Bruce Mah, Richard Cziva, Yatish Kumar        |
| 12:40pm    | <a href="#">Quantum Networks and the Role of Classical Networks</a>                             | Dan Kilper                                    |
| 1:05pm     | SCinet DTNaaS Developments part1 - part-2                                                       | Jim Chen, Se-young Yu, Ezra Kissel            |
| 1:30pm     | <a href="#">Policy Auditing in Data Exchange Systems</a>                                        | Paola Grosso, Reggie Cushing, Xin Zhou        |
| 1:50pm     | <a href="#">GNA: Toward a Next Generation Cyber-System</a> for Data Intensive Science Community | Harvey Newman, Joe Mambretti                  |
| 2:10pm     | XNet Futures Q&A                                                                                | Ezra Kissel, Cees de Laet, Mary Hester        |
| 2:25pm     | Closing                                                                                         |                                               |



SCinet contributions: Team members:

- UvA
  - J.P. Velders, teamlead Network Research Exhibition and deputy lead Architecture.
  - Cees de Laet, Team member Experimental Networks XNET
- SURF
  - Pieter de Boer, WAN team
- Overview of SCinet Architectures 1998 - 2020



Demo:

Policy Auditing In Data Exchange Systems.

Speakers: Paola Grosso, Xin Zhou, Reggie Cushing  
Co-authors: Ralph Koning, Adam Belloum, Sander Klous, Tom van Engers, Cees de Laet

Abstract: Digital Data Marketplaces allow to securely share data between competing parties. To maintain data sovereignty in such environments we translate market transactions into audited, secure network connections which enforce policies and track data exchanges. This challenge spans many layers from legal, where contracts about data sharing are formulated, down to network layers where fine-grained policy enforcement and tracking can take place. In this demo we focus on two aspects of the data market place:

- the network and its role in translating market transactions into secure network connections for data transactions, and
- the auditing plane that spans multiple domains and maintains an audit trail of the activities of the involved domains to validate the correct execution of the agreed upon transactions.

More material:

- slides

The screenshot shows a presentation slide with a circular diagram on the left and code on the right. The diagram has segments labeled 'Application', 'Network', 'Data', and 'Policy'. The code on the right is for an 'Auditor: Auditor\_VMCA' and includes comments in Dutch and English, such as 'De auditor wordt gebruikt om de netwerktransacties te auditeren' and 'The auditor is used to audit the network transactions'.



|                            |                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">2021-05-03</a> | Paper and <a href="#">presentation</a> : Mostafa Mohajeri Parizi, Giovanni Sileno, and Tom van Engers, "Seamless Integration and Testing for MAS Engineering", 9th International Workshop on Engineering Multi-Agent Systems                                                                                                                                                                       |
| <a href="#">2021-03-03</a> | Presentation by Cees de Laat at <a href="#">SC-Asia</a> in the Asia Pacific Research Platform (APRP) <a href="#">session</a> chaired by mr. Yves Poppe (NSCC): "ICT to support the transformation of Science in the Roaring Twenties"                                                                                                                                                              |
| <a href="#">2021-02-10</a> | Poster at <a href="#">ICT.Open 2021</a> Feb 10-11, 2021: Lu-Chi Liu, Giovanni Sileno and Tom van Engers, "Digital Enforceable Contracts (DEC): Making Smart Contracts Smarter.", <a href="#">poster</a> , abstract and <a href="#">movie</a> .                                                                                                                                                     |
| <a href="#">2021-02-10</a> | Poster at <a href="#">ICT.Open 2021</a> Feb 10-11, 2021: Mostafa Mohajeri Parizi, Giovanni Sileno and Tom van Engers, "Agent-Oriented Programming for Modern Cyber-Infrastructures", <a href="#">poster</a> , abstract and <a href="#">movie</a> .                                                                                                                                                 |
| <a href="#">2021-02-10</a> | Demonstrator at <a href="#">ICT.Open 2021</a> Feb 10-11, 2021: Xin Zhou, Reginald Cushing, Adam Belloum, Tom van Engers, Sander Klous, Cees de Laat, "Policy Enforcement for Secure and Trustworthy Data Sharing in Multi-domain Environments"                                                                                                                                                     |
| <a href="#">2020-12-31</a> | Paper: Xin Zhou, Reginald Cushing, Ralph Koning, Adam Belloum, Paola Grosso, Sander Klous, Tom van Engers, Cees de Laat, "Policy Enforcement for Secure and Trustworthy Data Sharing in Multi-domain Environments", Guangzhou, China, December 29, 2020 - January 1, 2021                                                                                                                          |
| <a href="#">2020-12-11</a> | Paper: Liu, L., Sileno, G., and van Engers, T., Digital Enforceable Contracts (DEC): Making Smart Contracts Smarter. Proceedings of the 33th International Conference on Legal Knowledge and Information Systems (LEGALMAN)                                                                                                                                                                        |
| <a href="#">2020-12-10</a> | Paper: Sileno, G., Boer, A., van Engers, T., Monitoring and enforcement as a second-order guidance problem. Proceedings of the 33th International Conference on Legal Knowledge and Information Systems (LEGALMAN)                                                                                                                                                                                 |
| <a href="#">2020-12-09</a> | Paper: Sileno, G., Boer, A., Gordon, G., Rieder, B., Like Circles in the Water: Responsibility as a System-Level Function. Proceedings of 3rd XAILA workshop: Explainable and Responsible AI and Law, in conjunction with the 33rd International Conference on Legal Knowledge and Information Systems (LEGALMAN)                                                                                  |
| <a href="#">2020-12-09</a> | Paper: Kebede Girma, M., Sileno, G., and van Engers, T., A critical reflection on ODRL. Proceedings of the 11th Workshop on Artificial Intelligence and the Complexity of Legal Systems AICOL2020, in conjunction with the 33rd International Conference on Legal Knowledge and Information Systems (LEGALMAN)                                                                                     |
| <a href="#">2020-11-19</a> | Paper: Mohajeri Parizi M., Sileno, G., and van Engers, T. Declarative Preferences in Reactive BDI Agents. Proceedings of PRIMA 2020: 23rd International Conference on Principles and Practice of Multi-Agent Systems                                                                                                                                                                               |
| <a href="#">2020-11-17</a> | Paper: Mohajeri Parizi M., Sileno, G., van Engers, T. and Klous, S., Run, Agent, Run; Architecture and Benchmarking of Actor-based Agents. AGERE! @ SPLASH 2020: ACM SIGPLAN conference on Software Engineering                                                                                                                                                                                    |
| <a href="#">2020-10-19</a> | Presentation by Leon Gommans for Netherlands Maritime Technology to explain "Data Sharing for AI, towards an industrial lab"                                                                                                                                                                                                                                                                       |
| <a href="#">2020-10-14</a> | Paper: Sileno, G. and Pascucci, M., "Disentangling Deontic Positions and Abilities: a Modal Analysis", 25th Edition of the Italian Conference on Computational Logic ( <a href="#">CILC</a> ), 13-15 October 2020 - Rende, Italy                                                                                                                                                                   |
| <a href="#">2020-10-14</a> | Presentation: Giovanni Sileno, Matteo Pascucci, "Disentangling Deontic Positions and Abilities: a Modal Analysis", 14 October 2020, 35th CILC Conference @ Rende ( <a href="#">virtual</a> ).                                                                                                                                                                                                      |
| <a href="#">2020-09-30</a> | Whitepaper: "The logistics data sharing infrastructure", H.J.M. Bastiaansen, C.H.M. Nieuwenhuis, G. Zomer, J.P.S. Piest, M. van Sinderen, S. Dalmolen, MSc TNO and W.J. Hofman < <a href="https://www.dinalog.nl/wp-content/uploads/2020/08/Dinalog_Whitepaper-Data-Infrastructure_DEF.pdf">https://www.dinalog.nl/wp-content/uploads/2020/08/Dinalog_Whitepaper-Data-Infrastructure_DEF.pdf</a> > |
| <a href="#">2020-09-29</a> | Letter and assessment submitted by SURF to the Ministry of Economic Affairs (previously the Ministry of Economic Affairs and Climate Policy) (Sedde, J. & C. van der Vliet, 2020): Een verslag naar de unieke Nederlandse bijdragen in GAIA                                                                                                                                                        |
| <a href="#">2020-09-24</a> | Paper: Mostafa Mohajeri Parizi, Tom van Engers, Giovanni Sileno, Sander Klous, "Run, Agent, Run; Architecture and Benchmarking of Actor-based Agents", ACM proceedings of AGERE '20, November 2020                                                                                                                                                                                                 |
| <a href="#">2020-09-19</a> | Paper: Giovanni Sileno, "Operationalizing Declarative and Procedural Knowledge: a benchmark on Logic Programming Petri Nets (LPPNs)", Proceedings of CAUSAL2020: Workshop on Causal Reasoning in Artificial Intelligence                                                                                                                                                                           |
| <a href="#">2020-09-19</a> | Presentation: Giovanni Sileno, "Operationalizing Declarative and Procedural Knowledge: a benchmark on Logic Programming Petri Nets (LPPNs)", Proceedings of CAUSAL2020: Workshop on Causal Reasoning in Artificial Intelligence                                                                                                                                                                    |
| <a href="#">2020-09-01</a> | Paper: eFLINT: a Domain-Specific Language for Executable Norm Specifications. L. Thomas van Binsbergen, Lu-Chi Liu, Robert van Doesburg, and Tom van Engers. Proceedings of GPCE '20. ACM.                                                                                                                                                                                                         |
| <a href="#">2020-08-20</a> | Paper: Cristian Hesselman, Paola Grosso, Ralph Holz, Fernando Kuipers, Janet Hui Xue, Mattijs Jonker, Joeri de Ruiter, Anna Sperotto, Roland van Rijswijk-Deij, Giovane C. M. Moura, Aiko Pras, Cees de Laat, "Service Operations and Management: Trends, Developments, and Directions", October 2020                                                                                              |
| <a href="#">2020-08-09</a> | Paper: Wouter van Haften / Alex Sangers / Tom van Engers / Somayah Djafari, "Coping with the general data protection regulation: Anonymization through multi-party computation technology.", IRIS/SCIENCE                                                                                                                                                                                          |
| <a href="#">2020-06-23</a> | Presentation by Leon Gommans at SURF to explain progress on building DDM prototype in AMdEX context: "Prototype: Digital Data Marketplace; Enabling Data Sharing for AI Development".                                                                                                                                                                                                              |
| <a href="#">2020-06-22</a> | Presentation at PACIS 2020 Conference, Dubai, 22nd - 24th June 2020. Virtual conference due to COVID-19 by Dr. H.J.M. Bastiaansen: "User-Centric Network-Model for Data Control with Interoperable Legal Data Sharing Artefacts", Dr. H.J.M. Bastiaansen                                                                                                                                           |
| <a href="#">2020-06-22</a> | Paper at PACIS 2020 Conference, Dubai, 22nd - 24th June 2020. Virtual conference due to COVID-19: "User-Centric Network-Model for Data Control with Interoperable Legal Data Sharing Artefacts", Dr. H.J.M. Bastiaansen                                                                                                                                                                            |
| <a href="#">2020-03-17</a> | Presentation and <a href="#">short paper</a> accepted for <a href="#">ICT.OPEN</a> 2020 (cancelled): Lu Zhang, Arie Taal, Cees de Laat, and Paola Grosso, "Risk level assessment for data exchange applications in Digital Data Marketplace"                                                                                                                                                       |
| <a href="#">2020-03-17</a> | Poster and <a href="#">short paper</a> accepted for <a href="#">ICT.OPEN</a> 2020 (cancelled): Mostafa Mohajeri Parizi, Giovanni Sileno, and Tom van Engers, "Integrating Preferences in Reactive BDI Agents."                                                                                                                                                                                     |
| <a href="#">2020-02-27</a> | Presentation at DL4LD Kickoff, UvA Amsterdam: Giovanni Sileno, "Overview on policy research tracks at SNE, ArenaA use case".                                                                                                                                                                                                                                                                       |
| <a href="#">2020-02-27</a> | Presentation at DL4LD Kickoff, UvA Amsterdam: Mostafa Mohajeri, "Policy making environment".                                                                                                                                                                                                                                                                                                       |
| <a href="#">2020-02-27</a> | Presentation at DL4LD Kickoff, UvA Amsterdam: Xin Zhou, "Policy Design and Optimization in Information Sharing; Operational Mobility Center case".                                                                                                                                                                                                                                                 |

• ~ 15 papers

• > 6 presentations

• 2 - 3 demonstrators & POC's

• ~ 3 posters

# Upcoming

- Preparations Scientific workshop (spring 2022)
- Update BluePrint
  - At various venues including Data Sharing Coalition
- Amsterdam Field Lab
  - Industrial Lab
- Dissemination Workshops

# Q&A

- More information:
  - <http://dl4ld.nl>
  - <http://dl4ld.net>
  - <http://delaat.net/sc>

