Subject: Statement of co-funding by the private partner(s)

City of Amsterdam
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Date: Feb. 24th 2017

Dear Sir/Madam,

Subject to successful completion of the Project Agreement, with all terms and conditions agreed by all contributors to the project, and if our proposal is honoured by NWO, I hereby promise to NWO the contribution which the City of Amsterdam will make for the project proposal for the Big Data: real-time ICT for Logistics call entitled DLa4LoG.

The principal applicant for this proposal is TNO.

The amount of the cash contribution is €100,000.

The amount of the in-kind contribution represents a value of €40,000, quantified in accordance with the guidelines in the Call for Proposals, Annex 6.

The in-kind contributions concern the following works:

- Participation in proposal defined project activities and workshops
- Providing necessary data and access to data
- Providing feedback on potential use cases and applications

Yours sincerely,

Ge Baron
Chief Technology Officer
City of Amsterdam

Digital Data Markets: real time ICT for logistics
Data Logistics 4 Logistics Data (dl4ld)

- PI’s: prof.dr. Robert Meijer (TNO & UvA), prof.dr.ir. Cees de Laat (UvA)
- PL: dr.ir. Harrie Bastiaansen
- TNO: dr. Wout Hofman, dr. Ir. Anne Fleur van Veenstra, Simon Dalmolen MSc
- UvA: dr. Paola Grosso, prof.dr. Tom van Engers
- KLM & UvA: dr. ing. Leon Gommans
- KPMG & UvA: prof. dr. Sander Klous
- Thales Nederland: dr. Kees Nieuwenhuis
- CIENA: Rodney Wilson, Marc Lyonais
- ORACLE: Loek Hassing
Main problem statement

- Organizations that normally compete have to bring data together to achieve a common goal!
- The shared data may be used for that goal but not for any other!
- Data may have to be processed in untrusted data centers.
  - How to enforce that using modern Cyber Infrastructure?
  - How to organize such alliances?
  - How to translate from strategic via tactical to operational level?
  - What are the different fundamental data infrastructure models to consider?
Secure Digital Market Place Research

- Law & Regulations
- Market rules
- Member admission

Secure Digital Marketplace

- Agreement
- Registry
- Deployment Models

Future Internet Research Testbeds

- Algorithm supplier(s)
- Data supplier(s)
- Market rules infrastructure
- Deployment Specification

- Parameterization & authorizations

- Customer(s)
- Member admission
- Accounting & Auditing

- Dispute Resolution
Detailed Approach

Why & What
- Digital business agreement negotiation & trust organized by member organization
- Architecture driven deployment of trusted system functions needed by business
- Creating Inter-organizational solutions

How
- Digital realization & implementation of trust
- Creating archetypes of deployment models
- Semantic composition of services
- Incorporating forward looking infrastructure architectures

With what
- Inter-organization service quality & consistency in practice
- Multidomain aspects (identity, AAA)
- Infrastructure programmability
- Programmable component deployment

Activity 1:
- Strategic
  - Digital business agreement negotiation & trust organized by member organization
  - Architecture driven deployment of trusted system functions needed by business
  - Creating Inter-organizational solutions

Activity 2:
- Tactical
  - Digital realization & implementation of trust
  - Creating archetypes of deployment models
  - Semantic composition of services
  - Incorporating forward looking infrastructure architectures

Activity 3:
- Operational
  - Inter-organization service quality & consistency in practice
  - Multidomain aspects (identity, AAA)
  - Infrastructure programmability
  - Programmable component deployment

Future Internet Capabilities

Algorithm supplier(s)
Data supplier(s)
Customer(s)

Deployment Models
Deployment Specification
Marketplace infrastructure
Parameterization & authorizations

Agreement
Registry

Law & Regulations
Market rules

WP4 Knowledge Exchange
WP3 Sector Requirements

Topsector Fieldlabs (Logistics, Smart Industry, Health, AgriFood...)
National & International Academic Fieldlabs
Big Data Sharing use cases placed in airline context

- **Global Scale**
  - Aircraft Component Health Monitoring (Big) Data
    - NWO CIMPLO project
    - 4.5 FTE

- **National Scale**
  - Cargo Logistics Data
    - (C1) DaL4LoD
    - (C2) Secure scalable policy-enforced distributed data Processing (using blockchain)
    - NLIP iShare project

- **City / regional Scale**
  - Cybersecurity Big Data
    - NWO COMMIT/SARNET project
    - 3.5 FTE

- **Campus / Enterprise Scale**
  - NWO COMMIT/SARNET project
  - 4.5 FTE
Data Processing models

• Bring data to computing
• Bring computing to data
• Bring computing and data to (un)trusted third party
• A mix of all of the above
• Block chain to record what happened
• Block chain for data integrity
• Bring the owner of Data in control!
• Data owner policy + PEP technology
SC16 Demo

DockerMon

Sending docker containers with search algorithms to databases all over the world.

http://sc.delaat.net/sc16/index.html#5
The VMs that are live-migrated run an iterative search-refine-search workflow against data stored in different databases at the various locations. A user in San Diego gets hitless rendering of search progress as VMs spin around.
Experiment outcomes
Note, this was in 2005 at SC and igridd2005!

We have demonstrated seamless, live migration of VMs over WAN.

For this, we have realized a network service that
- Exhibits predictable behavior; tracks endpoints
- Flex bandwidth upon request by credited applications
- Doesn’t require peak provisioning of network resources

Pipelining bounds the downtime in spite of high RTTs:
- San Diego – Amsterdam, 1GE, RTT = 200 msec, downtime <= 1 sec
- Back to back, 1GE, RTT = 0.2-0.5 msec, downtime = ~0.2 sec*

*Clark et al. NSDi 05 paper. Different workloads

VM + Lightpaths across MAN/WAN are deemed a powerful and general alternative to RPC, GRAM approaches.

We believe it’s a representative instance of active cpu+data+net orchestration.

Ambition to put capabilities into fieldlab

- R & E Networks
- 100 Gb/s Lightpath
- SARNET Capable Cyber-defense
- Digital Airport AMS
- CDG
- ATL

Data Transfer Node

Big Data sharing
Fast Data Replication

Open Flow Switch

100 Gb/s

10 Gb/s

Application & Service chains deployed in private and secure Internet slices

Private & Secure Collaboration

SAGE2 Server

SAGE2

GENI Rack

Re-enforcing ICT preconditions:
Each envisaged site has similar elements
Ambition to put capabilities into fieldlab
Ambition to put ICT at the heart of the value chain:

- **Application & Service Collaboration**
- **Private & Secure Internet Slices**

The ICT site has similar elements to the image above.
The GLIF – LightPaths around the World

SAE Use Case envisaged research collaboration

- **Funding Agency**
  - NSF
  - NWO

- **International Networking**
  - Internet2
  - ESnet
  - GÉANT

- **Regional / National Networking**
  - CENIC
  - SoX
  - LEARN
  - SURFNET

- **Local University**
  - Stanford
  - Georgia Tech
  - UT Dallas
  - Universiteit van Amsterdam

- **Aircraft MRO, OEM & Operators**
  - Boeing
  - Delta Air Lines
  - Bell Helicopter
  - Air France KLM

- **Industry Standards Body**
  - SAE Aerospace Group
    - HM-1 working group
    - Use Case on aircraft sensor Big Data

**System and Network Engineering**

**Air France KLM**
Research goal:
Explore value of academic network research capabilities that enable innovative ways & models to share big data assets.
Approach

• Strategic:
  – Translate legislation into machine readable policy
  – Define data use policy
  – Trust evaluation models & metrics

• Tactical:
  – Map app given rules & policy & data and resources
  – Bring computing and data to (un)trusted third party
  – Resilience

• Operational:
  – TPM & Encryption schemes to protect & sign
  – Policy evaluation & docker implementations
  – Use VM and SDI/SDN technology to enforce
  – Block chain to record what happened (after the fact!)
Secure Policy Enforced Data Processing

- Bringing data and processing software from competing organisations together for common goal
- Docker with encryption, policy engine, certs/keys, blockchain and secure networking
- Data Docker (virtual encrypted hard drive)
- Compute Docker (protected application, signed algorithms)
- Visualization Docker (to visualize output)
Networks of ScienceDMZ’s & SDX’s

Internet
Peer ISP’s

SDN

ISP

NFV

Func-c1

Func-c3

SDX

SDX

SDX

ISP

ISP

ISP

ISP

Supercomputing centers
(NCSA, ANL, LBNL)

Petabyte email service 😊
Q&A

• More information:
  – http://delaat.net/sarnet
  – http://delaat.net/dl4ld