From the Amsterdam Research Platform (ARP)

Globally Distributed Secure Data Exchange Fabrics

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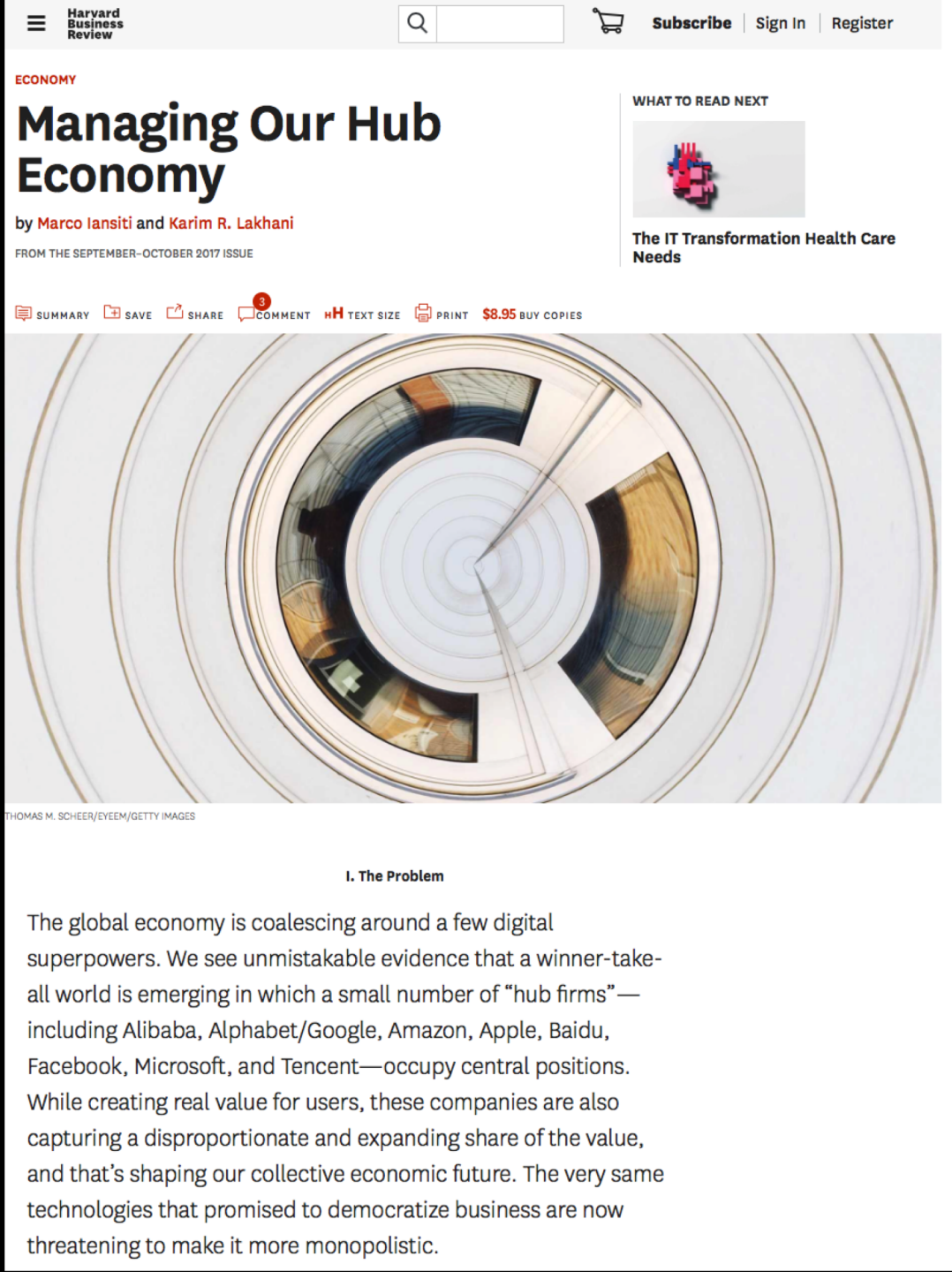
Harvard Business Review



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ECONOMY

Managing Our Hub Economy

by Marco Iansiti and Karim R. Lakhani

FROM THE SEPTEMBER–OCTOBER 2017 ISSUE

WHAT TO READ NEXT

The IT Transformation Health Care Needs

SUMMARY SAVE SHARE 3 COMMENT TEXT SIZE PRINT $8.95 BUY COPIES

THOMAS M. SCHEER/EYEEM/GETTY IMAGES

I. The Problem

The global economy is coalescing around a few digital superpowers. We see unmistakable evidence that a winner-take-all world is emerging in which a small number of "hub firms"—including Alibaba, Alphabet/Google, Amazon, Apple, Baidu, Facebook, Microsoft, and Tencent—occupy central positions. While creating real value for users, these companies are also capturing a disproportionate and expanding share of the value, and that's shaping our collective economic future. The very same technologies that promised to democratize business are now threatening to make it more monopolistic.

HARVARD BUSINESS PUBLISHING

Data value creation monopolies

→

Create an equal playing field

→

Sound Market principles

https://hbr.org/2017/09/managing-our-hub-economy

Main problem statement

- There is lots of data out there that is not shared (99%)
- FAIR is typically not fair ;-), but limited by policy and/or law
  - the A in FAIR is about access, trust is hard to implement across domains
- Organizations that normally compete have to bring data together to achieve a common goal/benefit!
- The shared data may be used for that goal but not for any other!
- Expected use is fine but unexpected use/mission creep…
- Data processed by alien algorithms in foreign data centers... Hmmm…
  - How to organize data processing alliances?
  - How to enforce policy using modern Cyber Infrastructure?
  - How to translate law policy from strategic via tactical to operational level?
  - What are the different fundamental data infrastructure models to consider?

Big Data Sharing use cases placed in airline context

Global Scale

National Scale

City / regional Scale

Campus / Enterprise Scale

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

Cargo Logistics Data
(C1) DL4LD
(C2) Secure scalable policy-enforced distributed data Processing
(using blockchain)

NLIP iShare project

Cybersecurity Big Data
NWO COMMIT/
SARNET project
3.5 FTE

https://delaat.net/dl4ld

All for one and one for all

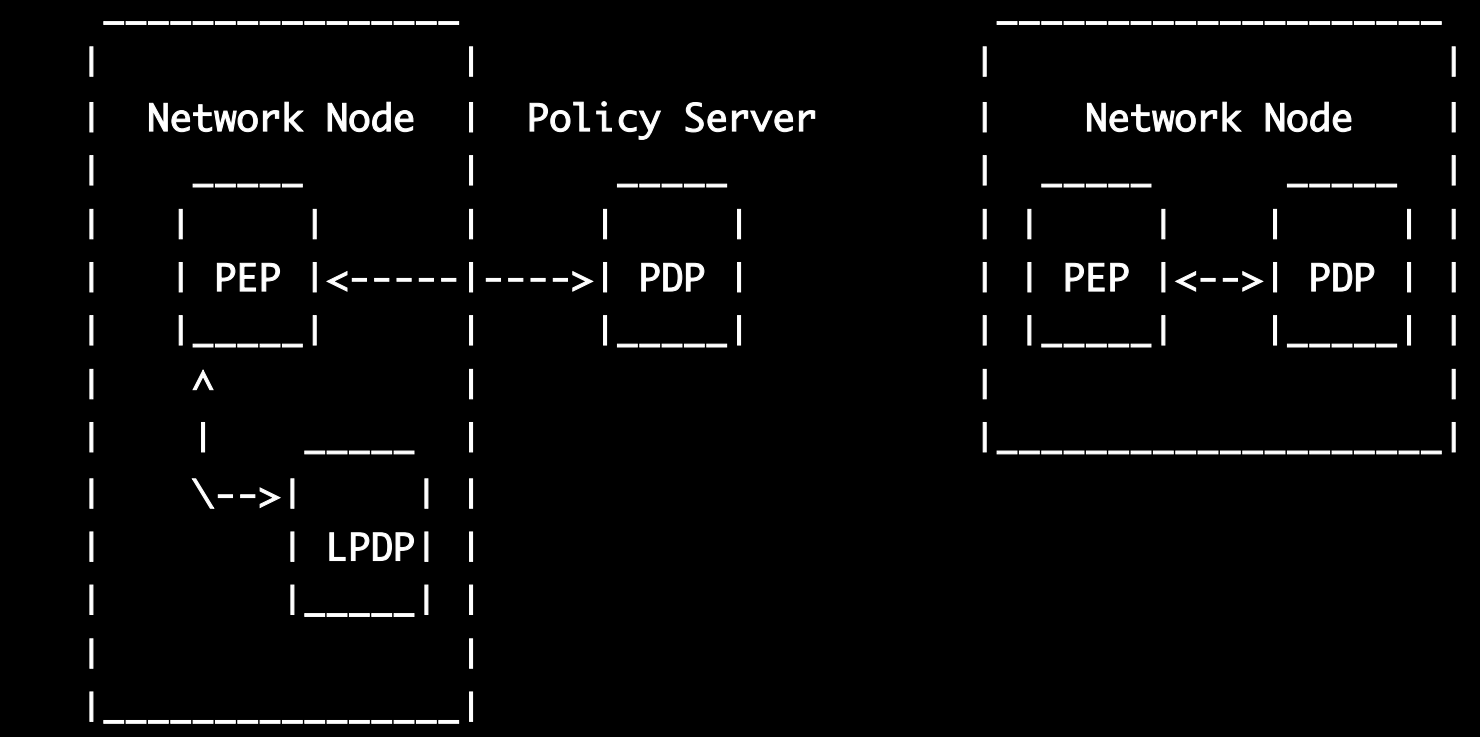
- All for one
  - Many infrastructures centered around compute and workflows
- One for all
  - Now we need to get a fluid data layer that frees data to be shared and used by (unforeseen) applications
- Efforts as FAIR and ScienceDMZ / DTN fabrics pave the way to solve the data problem that is also encountered by industry.

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!)

IETF: Common Open Policy Service (COPS)

- Rfc 2748, 2753, 4261



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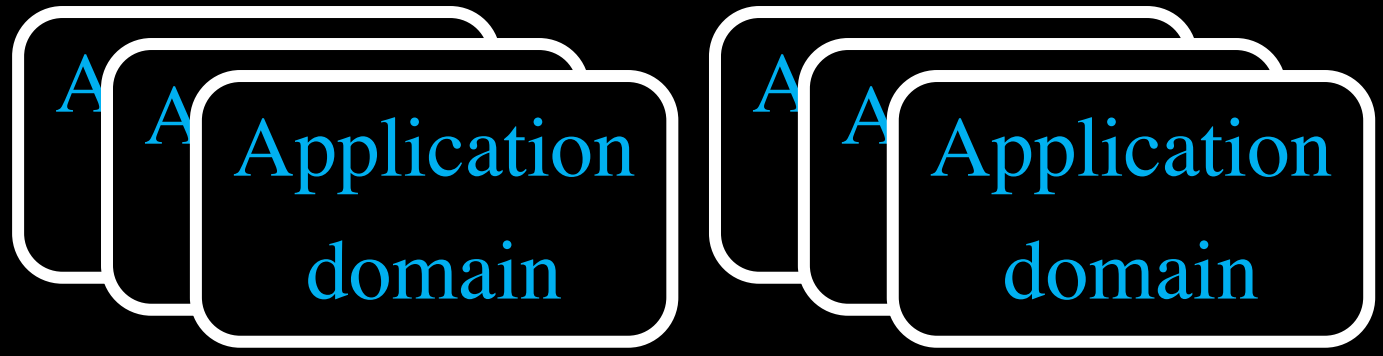


AmDex

Data objects & methods
Data & Algorithms service

FAIR / USE

AmsIX

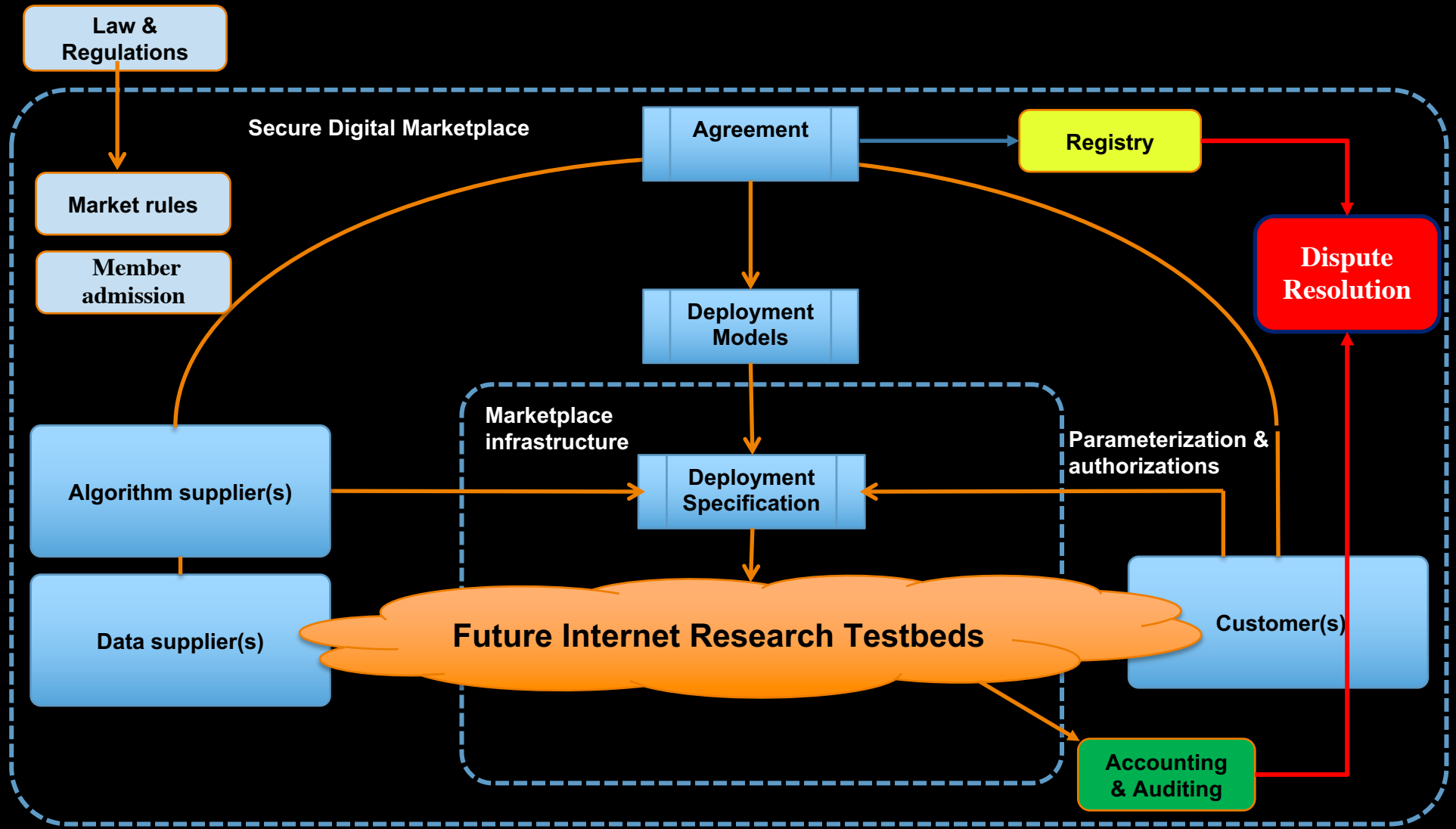
Routers - Internet – ISP's - Cloud
IP packet service

IP / BGP

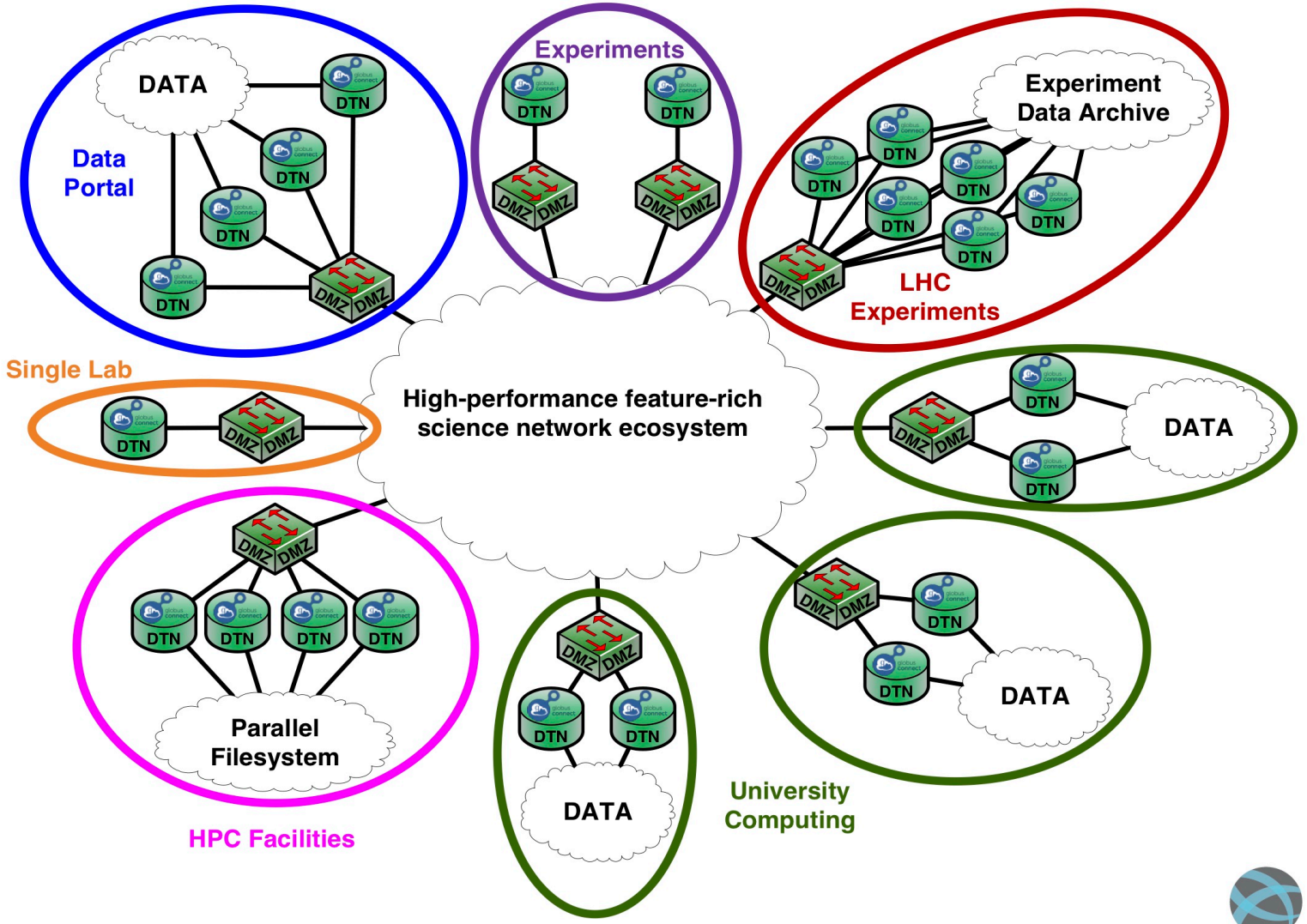
Layer 2 exchange service
Ethernet frames

ETH / ST

Secure Digital Market Place Research



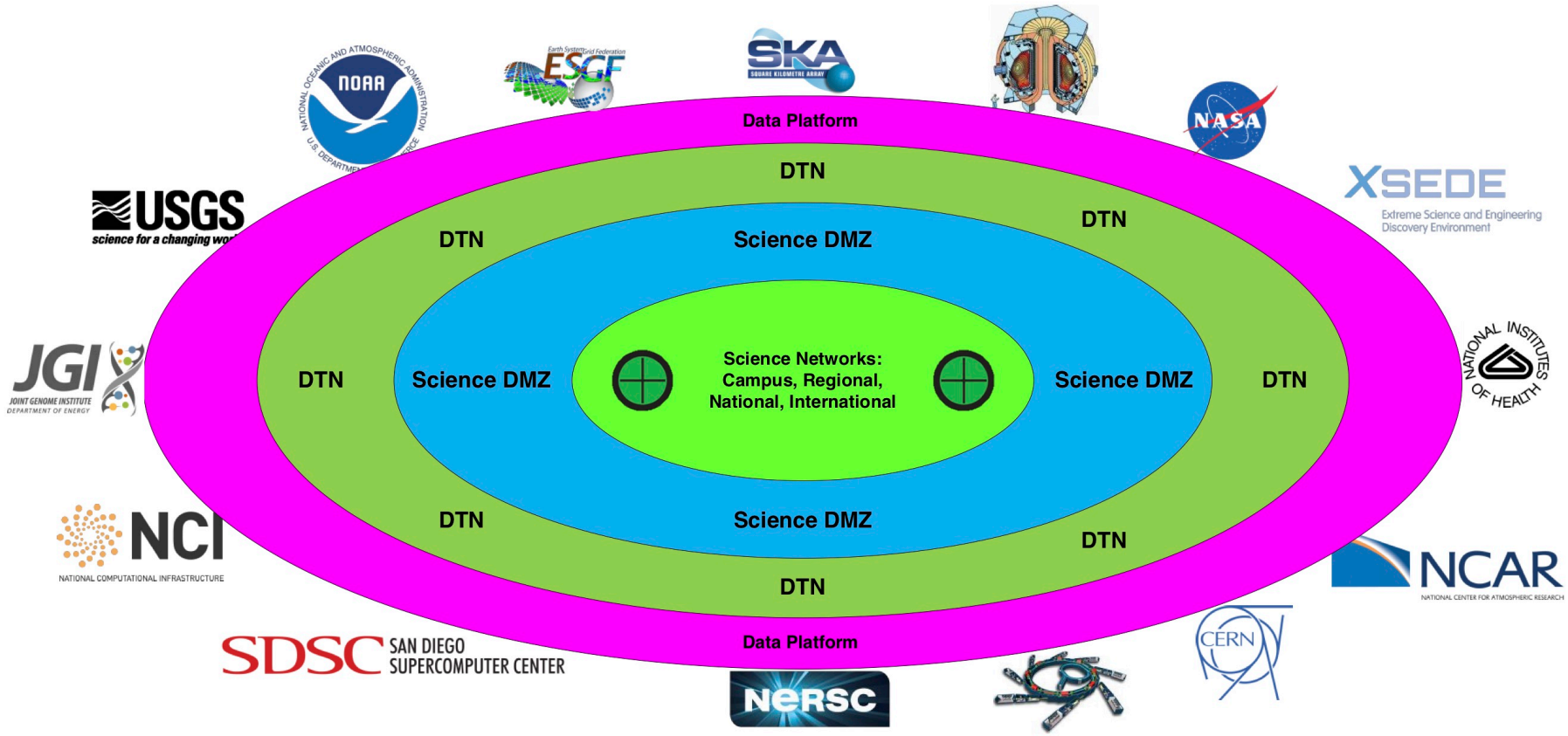
Science DMZs for Science Applications



ESnet

Courtesy Eli Dart, ESnet

Data Ecosystem – Concentric View



ESnet

Courtesy Eli Dart, ESnet

The Big Data Challenge

Doing Science

ICT to enable Science

Scientists live here!

Wis dom

AI

Interdisciplinary Science App Store

Analytics library / Github / etc

Knowledge to act

Analytics Decision Support

MAGIC DATA CARPET

curation - description - trust - security - policy – integrity

Information

Web/OWL

Data

a.o. from ESFRI's

Docker, VM,
XML, RDF, rSpec, SNMP

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XML, RDF, rSpec, SNMP

DSC eScience

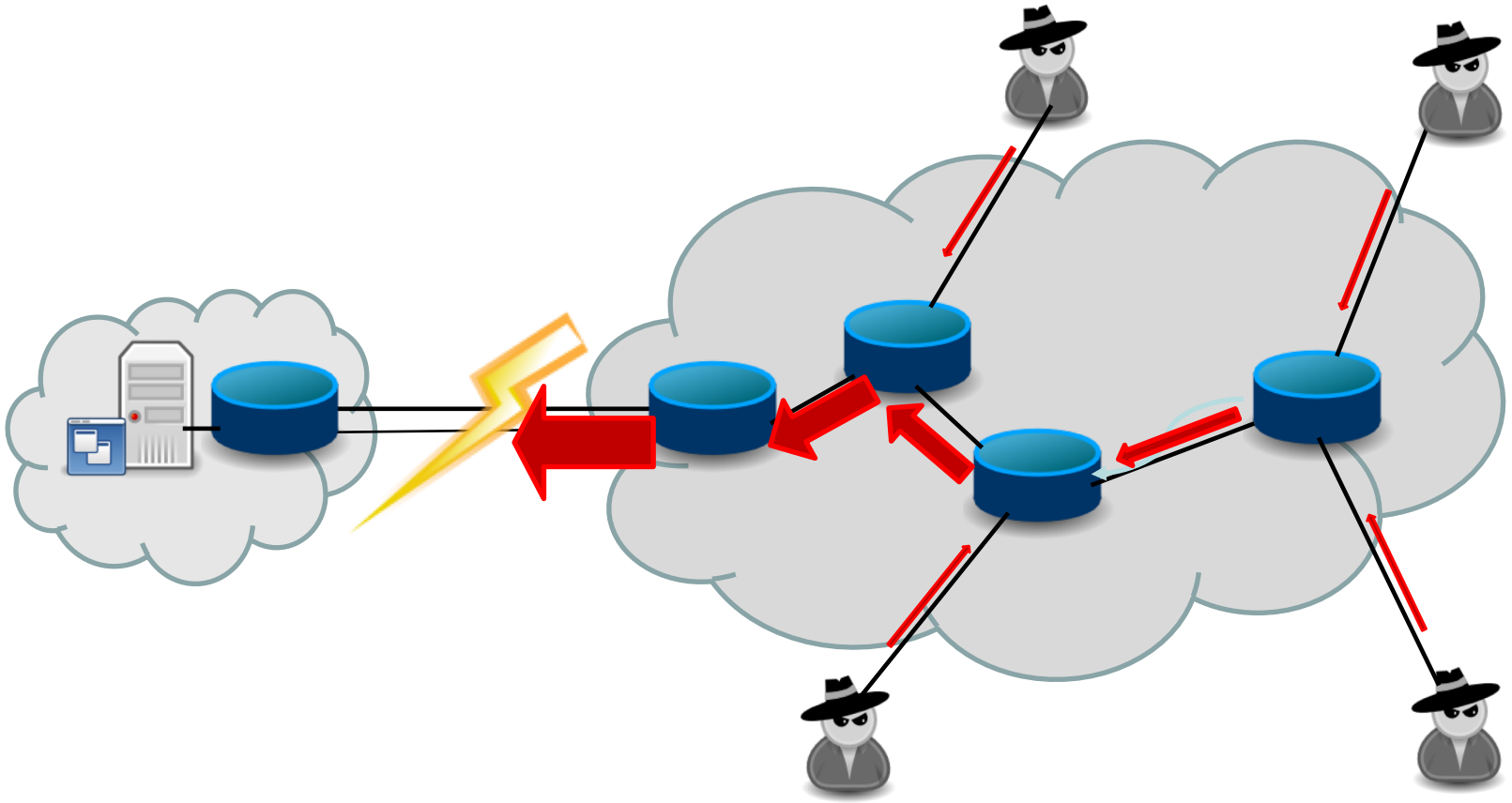
RDM/ DANS

ICT/ SURF

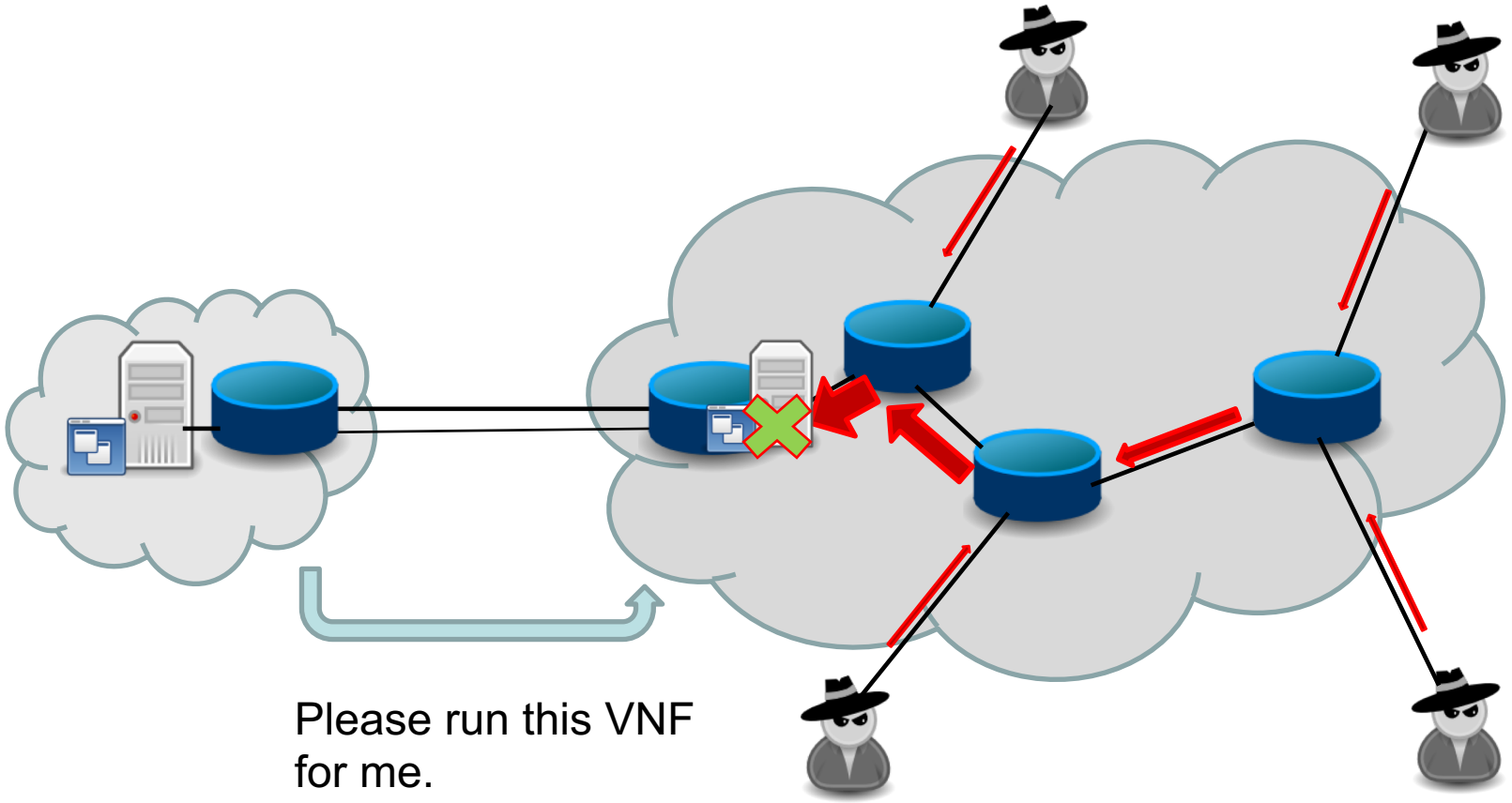
Open research questions

How do we ensure security in these large distributed environments?

Multi domain: Remote NFV

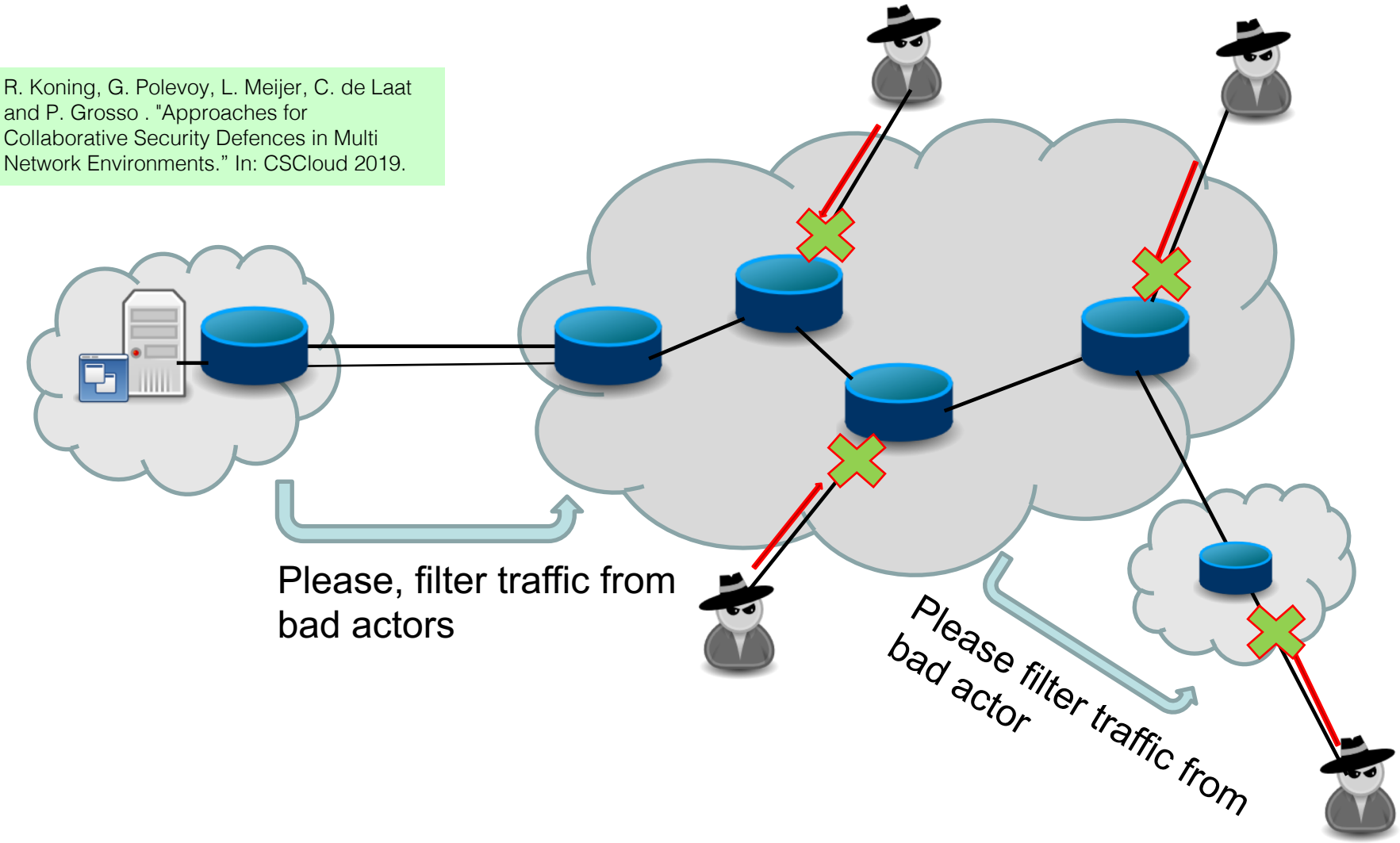


Multi domain: Remote network functions



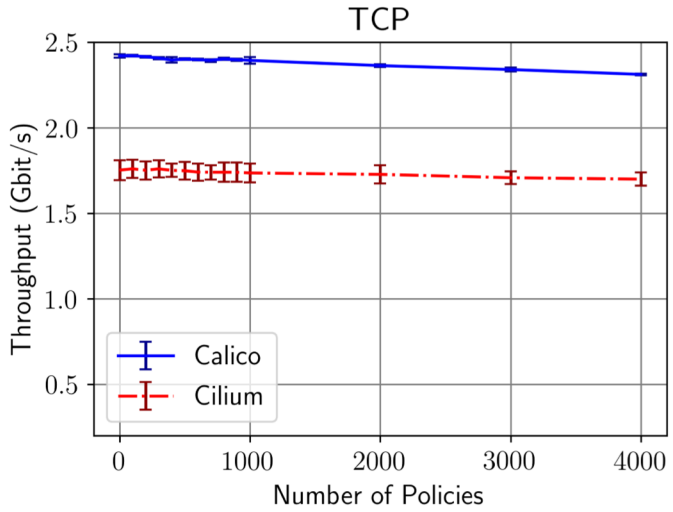
Multi domain: blocking close to source

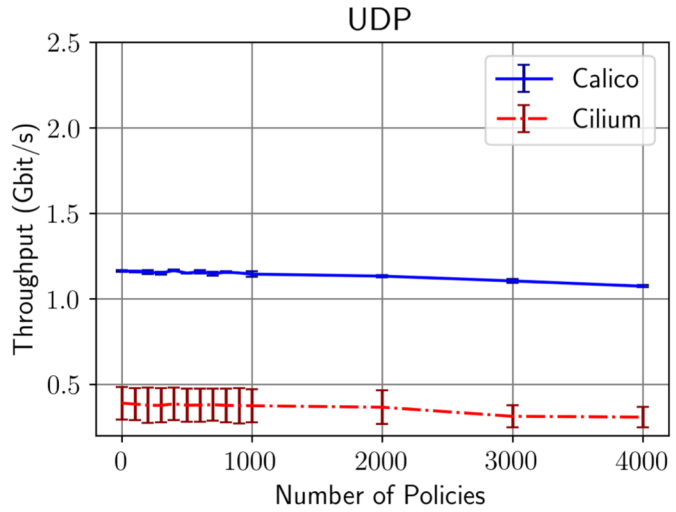
R. Koning, G. Polevoy, L. Meijer, C. de Laat and P. Grosso . "Approaches for Collaborative Security Defences in Multi Network Environments." In: CSCloud 2019.

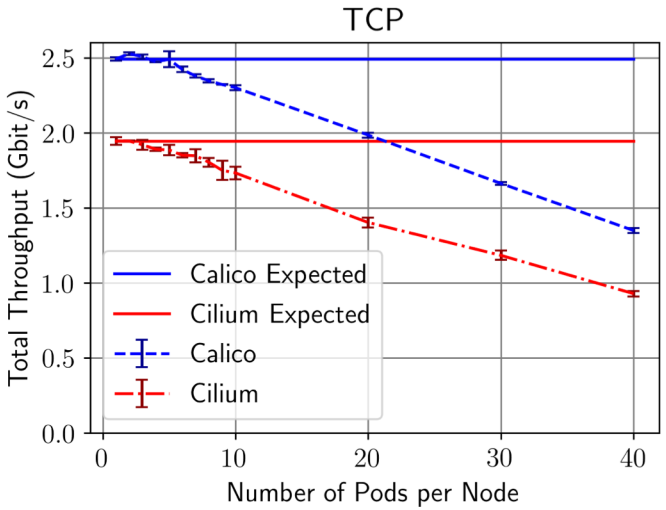


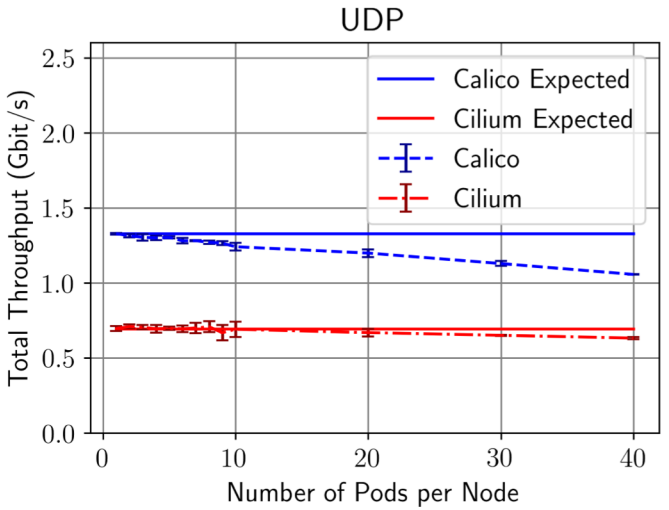
How do we scale the virtual network functionalities in the different sites?

Pod scalability/policy scalability







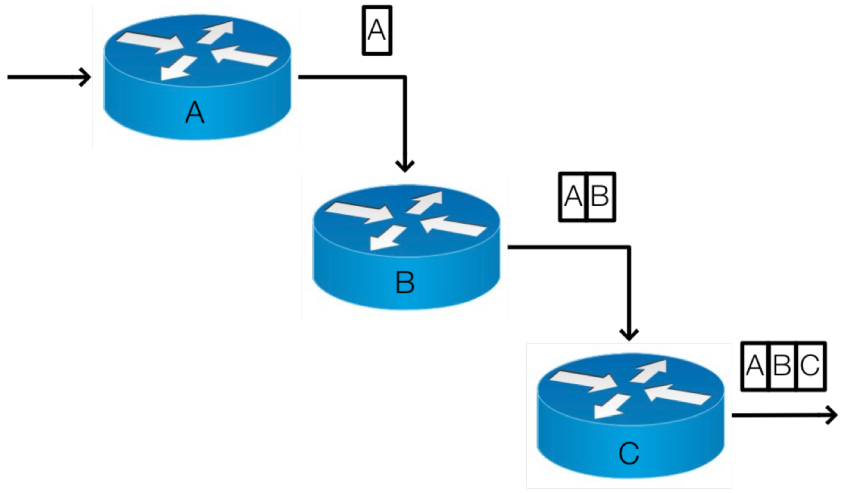


S. Shakeri, N. van Noort and P.Grosso
Scalability of Container Overlays for Policy Enforcement in Digital Marketplaces
In: Cloudnet 2019

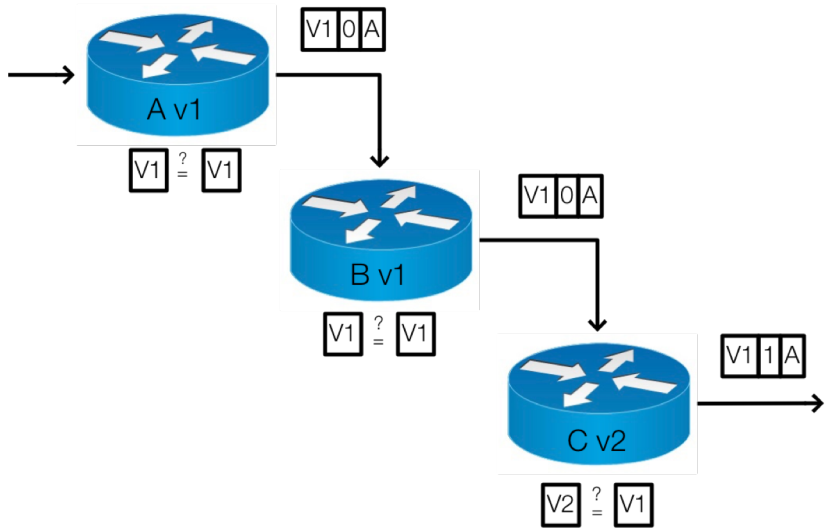
How do we control/steer network traffic in these environments?

P4 programmability

S. Knossen, J. Hill and P.Grosso
Hop Recording and Forwarding State Logging: Two Implementations for Path Tracking in P4
In: INDIS 2019

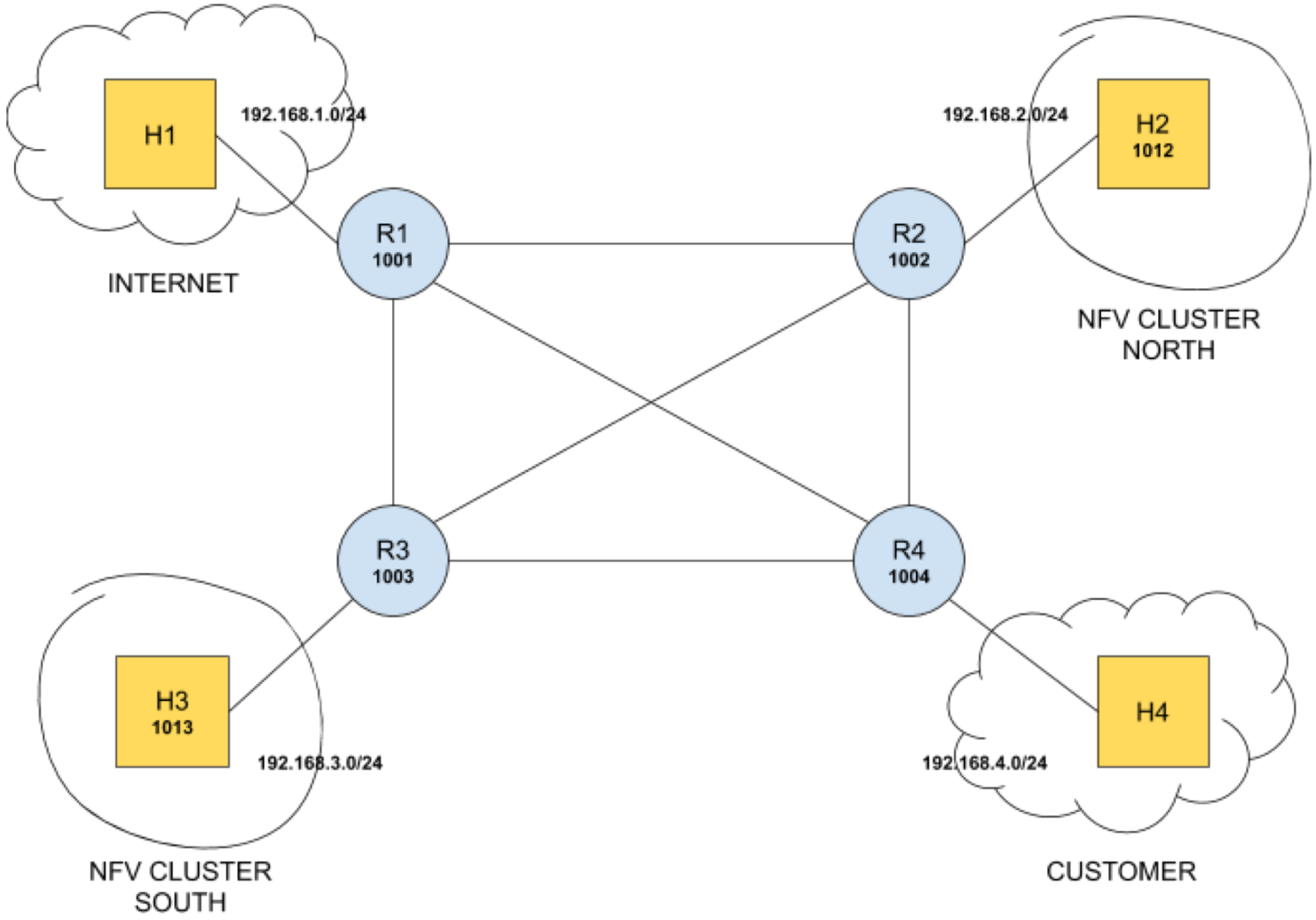


Hop recording



Logging forwarding state

Segment routing



Conclusions, Info, Acknowledgements, Q&A

- Data hindered by risk of unexpected use, lack of trust
- Using market principles, enforcement and determining incentives and value in the data life cycle to make data flow
- More information:
  - http://delaat.net/dl4ld http://delaat.net/epi
  - https://www.esciencecenter.nl/project/secconnet
  - https://towardsamdex.org

TNO Ministerie van Economische Zaken KPMG cutting through complexity SURF SARA ciena VU VRIJE UNIVERSITEIT AMSTERDAM Universitair Medisch Centrum Utrecht PHILIPS AIR FRANCE KLM CWI VU medisch centrum
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