

## USER-DRIVEN PATH VERIFICATION AND CONTROL FOR INTER-DOMAIN NETWORKS



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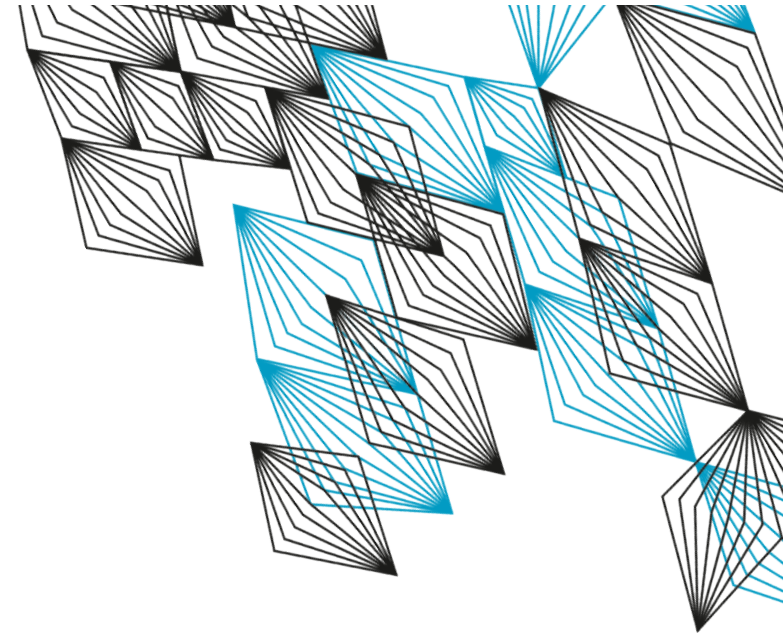
Project Logo  
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## UPIN KICKOFF

CRISTIAN HESSELMAN (SIDN LABS AND UNIVERSITY OF TWENTE)

JANUARY 15, 2020

This research received funding from the Dutch Research Council (NWO) as part of the UPIN project





# TODAY'S GOAL

- Recap of UPIN
  - Get to know the UPIN researchers
  - Update on status and future work
  - Get your feedback
- 
- Result: UPIN top of mind again, further improve researchers' work based on your feedback



# PROPOSED AGENDA

- 13:00 Opening (Cristian)
- 13:05 Introductions (All)
- 13:15 Recap UPIN (Cristian)
- 13:30 Path control (Leonardo)
- 14:00 Path discovery and verification (Rodrigo)
- 14:30 Discussion (All)
- 15:15 Project management (Cristian)
- 15:30 Adjourn

# UPIN CORE TEAM



Rodrigo Bazo  
(UT)



Leonardo Boldrini  
(UvA)



Cristian Hesselman  
(SIDN Labs, UT)



Paolo Grosso  
(UvA)



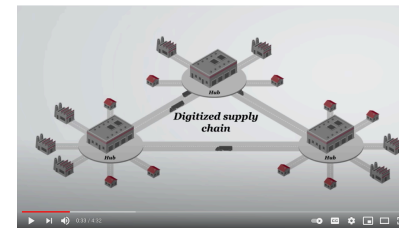
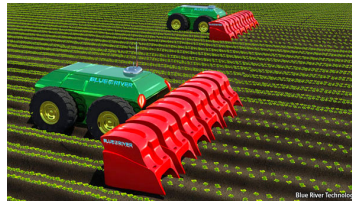
# PROBLEM: DATA AUTONOMY “IN TRANSIT”

- Lack of **transparency** and **control** of how users' data flows travel across the Internet
- What network operators handle my data? How secure are their routers? I only want to use security-audited networks!
- Security risks for **critical services** like remote controlled healthcare robots, energy grids, intelligent transport systems

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Reduced trust in the Internet infrastructure

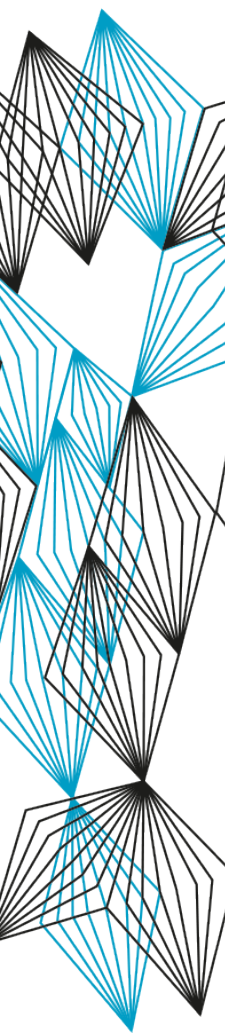




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# RESEARCH QUESTIONS

- 
- How do we make the Internet more transparent and provide Internet users with more control over and verifiability of network paths in a scalable way?
  - To what degree can the current Internet architecture accommodate these functions and which other emerging inter-network architectures might potentially be more suitable?

# UPIN GOAL

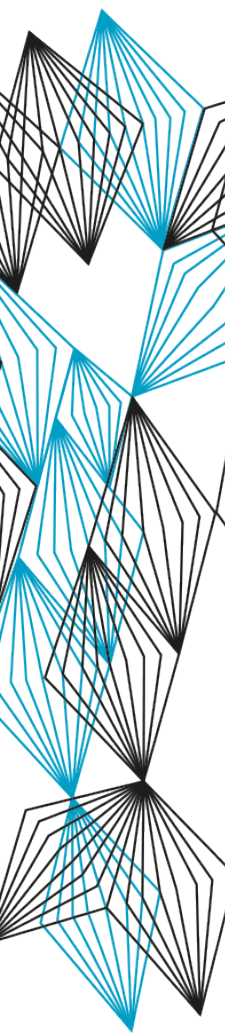
Develop and evaluate a scalable system that enables users (e.g., individuals and organizations) to verify and control how their data travels through the Internet or other types of inter-networks



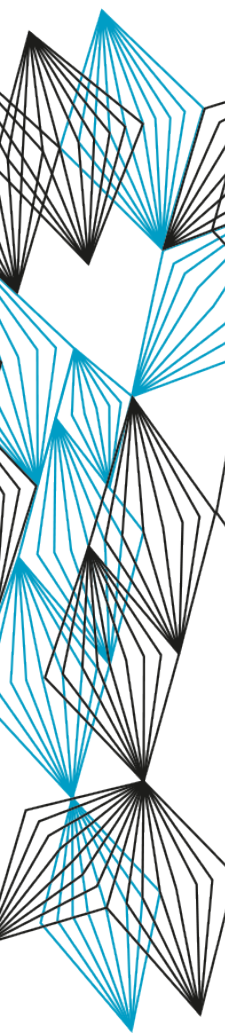
Increase data autonomy in transit



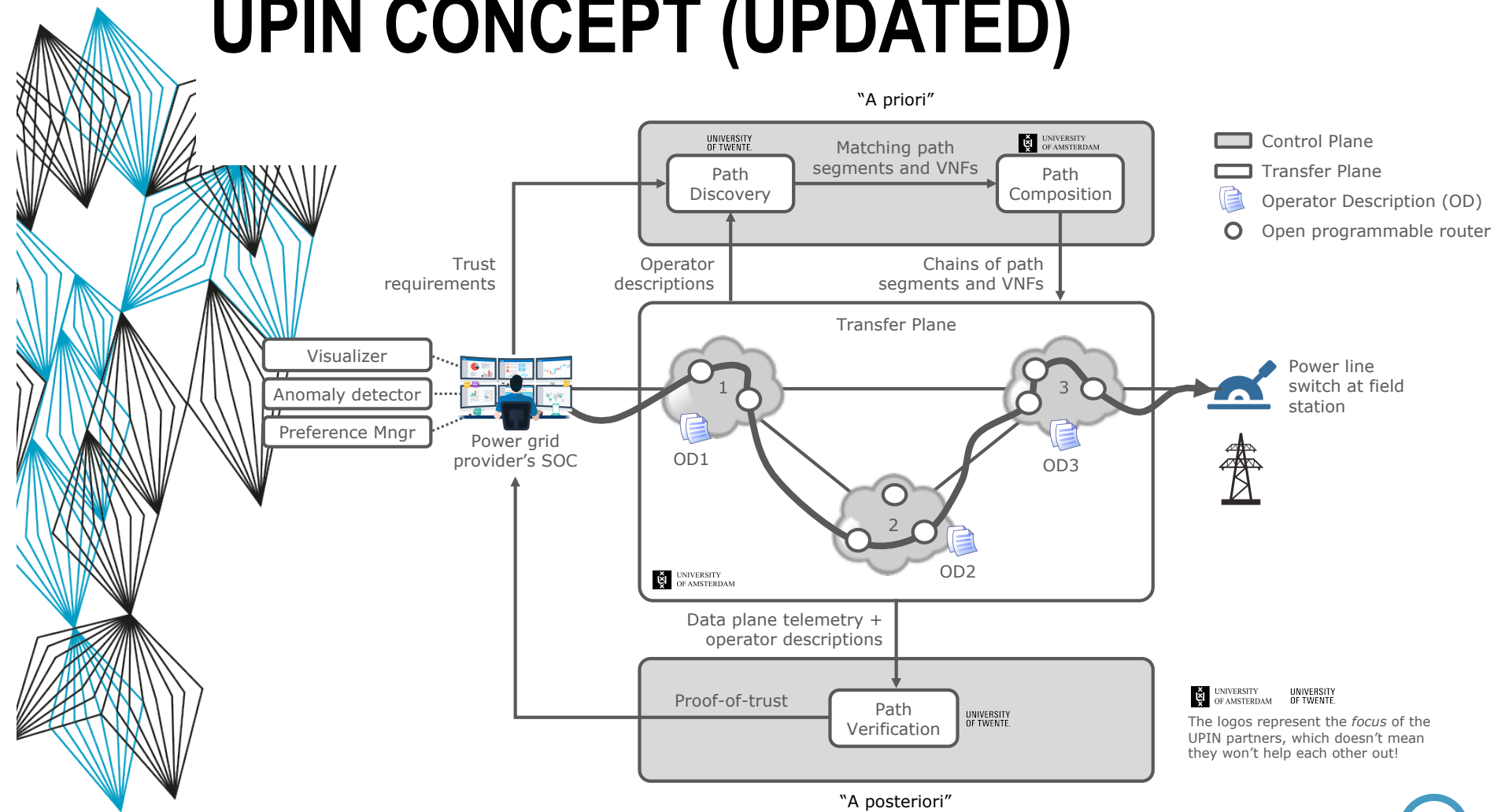
# HIGH LEVEL APPROACH

- 
- Enable users to specify path attributes that UPIN enforces
    - Homogeneous legal jurisdictions (cf. “Schengen routing”)
    - Trusted network operators
    - Geolocations of routers and application servers
    - Trusted router vendors (e.g., those assumed not to have backdoors)
  - Provide users with “proof-of-path”
    - Cryptographically verifiable descriptions paths that data took
    - Hops, routers, network operators

# INNOVATIONS

- 
- Novel mechanisms for path discovery, control, and verification based on source's trust requirement and attestation of routers
  - New data and control plane protocols that implement these mechanisms using programmable routers and SDN
  - Evaluation of the performance and expected scalability of the UPIN system using the 2STiC testbed

# UPIN CONCEPT (UPDATED)





# KEY RESULTS

- System design and open-source implementation
- Evaluations of through use cases on 2STiC testbed
- Demonstrators of the UPIN concept
- Academic and other publications, annual workshop

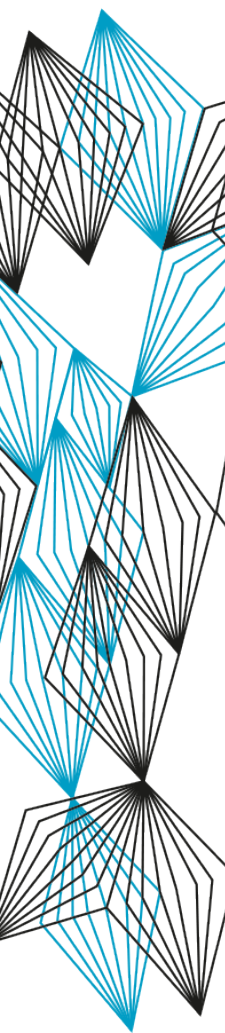


# TARGETED IMPACT

- Increased **user** control over data in transit
- Enable new types of network and service **operators**
- Advance emerging **standards** (e.g., path-aware networking)
- Increased **pool of knowledge** of academic and operator communities

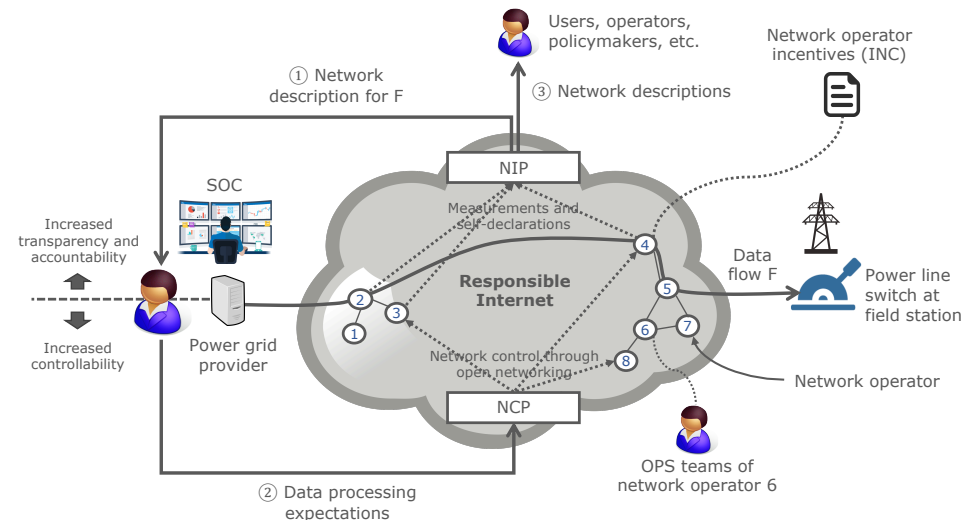


# UPIN AND 2STIC

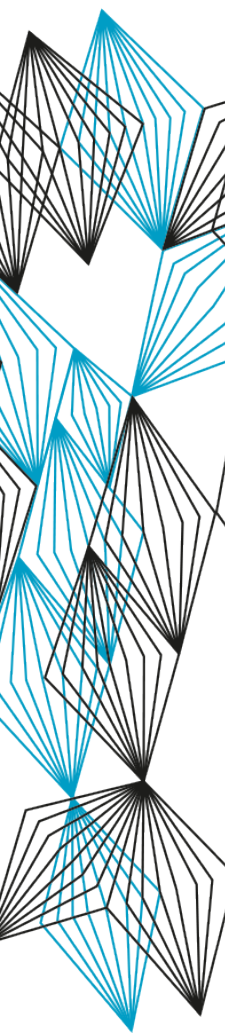
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- “2STiC's goal is to develop and evaluate mechanisms for increasing the security, stability and transparency of internet communications, for instance by experimenting with and contributing to emerging internet architectures, such as SCION, RINA, and NDN, as well as the existing (IP-based) Internet.”
  - All partners in 2STiC: UvA, UT, SIDN, NLnet Labs, SURF

# UPIN AND RESPONSIBLE INTERNET

- Focus on communication transparency, accountability, and controllability
- Overlap with infrastructure and operations T-A-C
- Out of scope: “external” measurements (NIP)

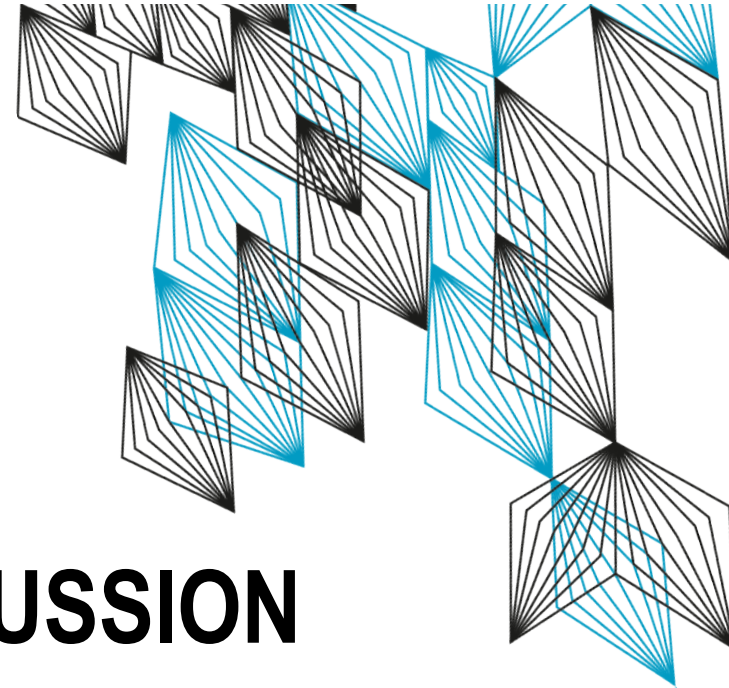


# CURRENT STATUS

- 
- Abstract submitted to ICT.Open
  - Working on a joint blog: motivation, scenarios, RQs, approach
  - Initial website: <https://mns-research.nl/upin/>
  - Getting hands-on experience (VNF test network @ UvA, P4)

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# QUESTIONS AND DISCUSSION

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