

XIC12

BLOCKCHAIN FOR SUPPLY CHAIN AND LOGISTICS FORUM

www.blockchainsupplychain.io

HOUSTON, TEXAS

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Powering Blockchain Innovation through Academic—Industry Partnership



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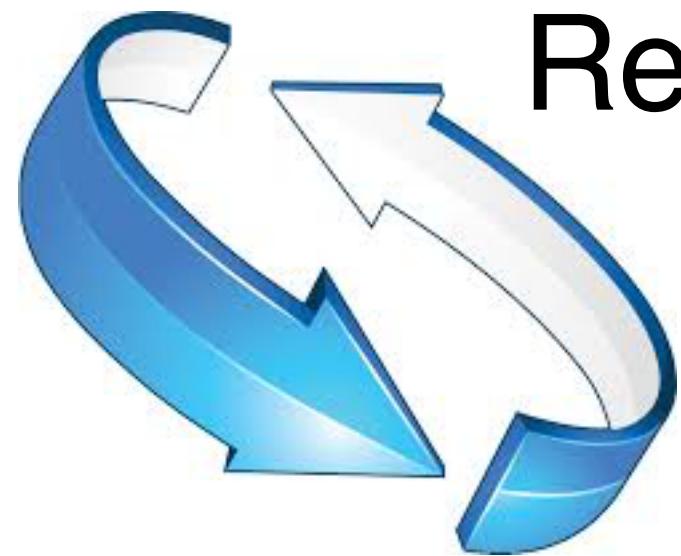
How academia can help maturing blockchain technology and ecosystem

Shin'ichiro Matsuo and Paul Brigner
B-TED Research Center, Georgetown University

XC2: Blockchain for Supply Chain and Logistics Forum



How Mature?



Refinement by iteration

Experimental

Technically
Confirmed

Commercialization

New Applications/
Ecosystem

Several huge incidents



Mt. Gox



The DAO Attack



Coincheck



Monacoin

Technology Issues of Current Blockchain

Cryptography and
Cryptographic Operation

Secure System Design
and Operation

Trade-off between
Performance/Scalability
and “De-centralization”

Finality and Immutability

+ Need healthy community and ecosystem
by designing better incentive/economic model

Game theory/ incentives / regulation

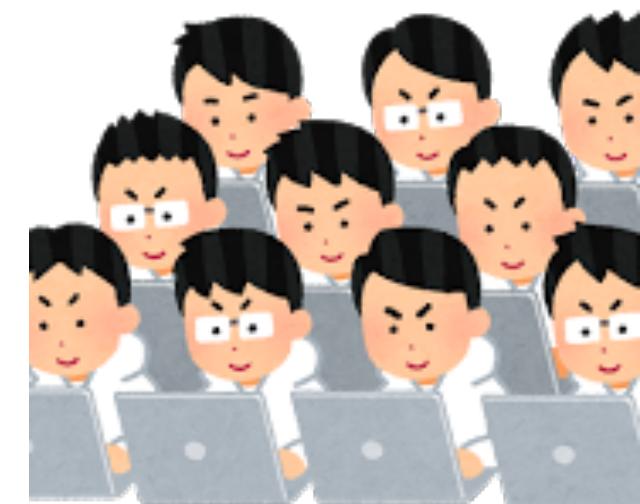
**The Security of Bitcoin/
Cryptocurrency/Public Blockchain
relies not only on technology but
also on incentive design.**

**Some flaws in the current design of
Bitcoin ecosystem are the cause of
debates and chaos.**

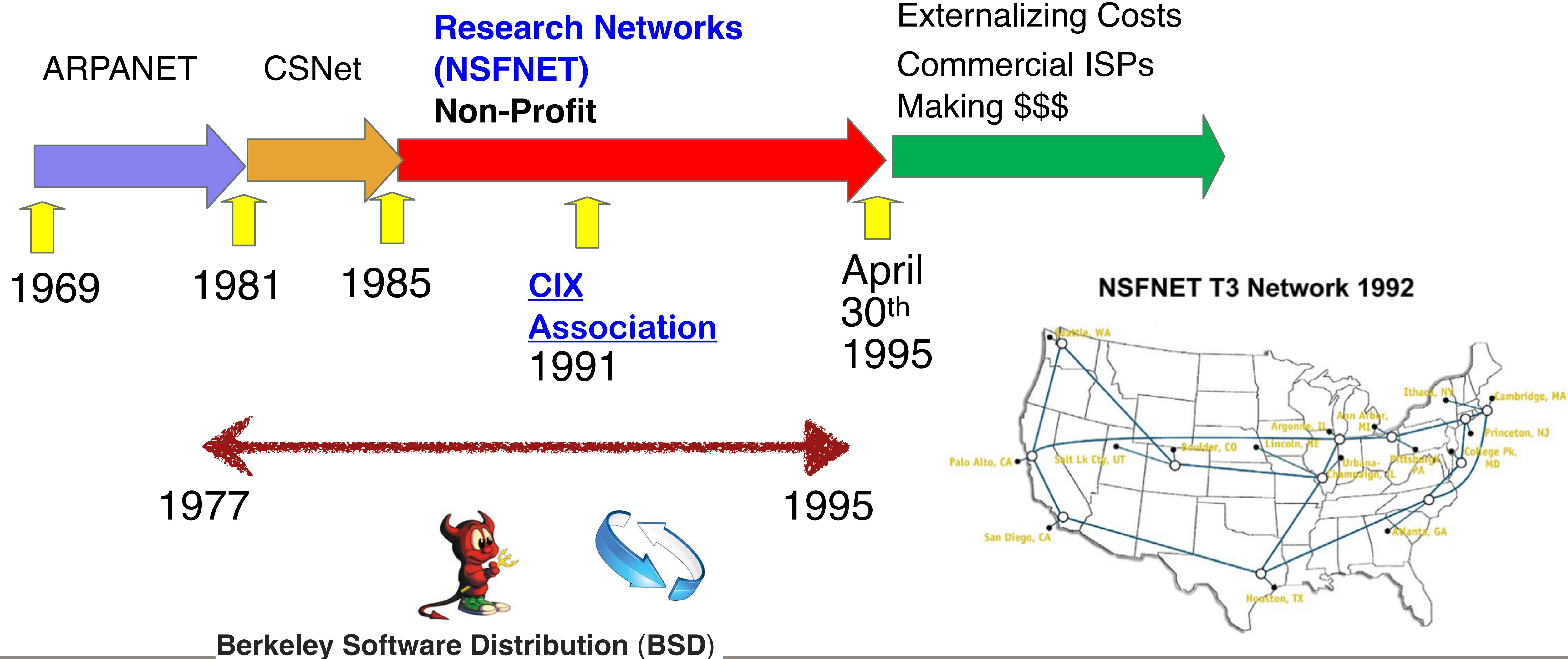
Regulation: Recent hot topic



Games in
blockchain
ecosystem



NSFNet for the Internet

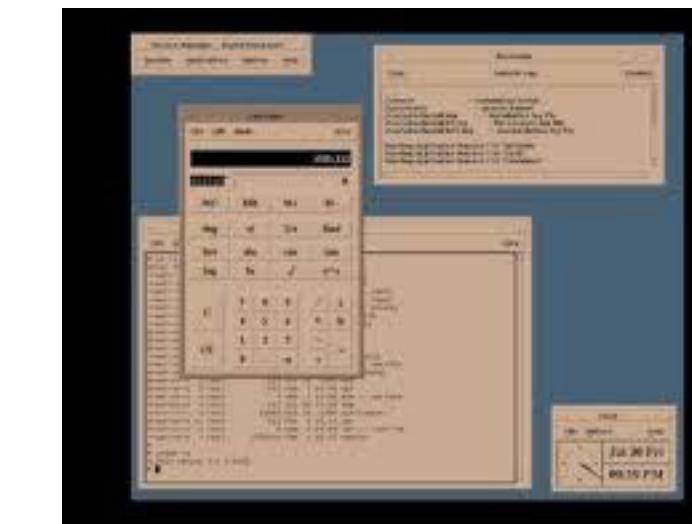


History of Berkeley Software Distribution (BSD) UNIX

AT&T
Unix

Came to
Berkeley

Beginning of
BSD Unix



Ultrix (DEC)



SunOS

4.4 BSD Lite
Release 2



1969

1974

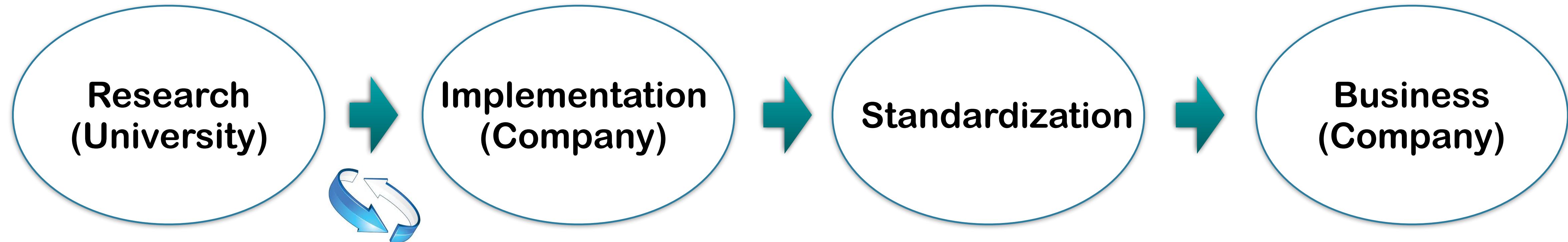
1977

1990

1995

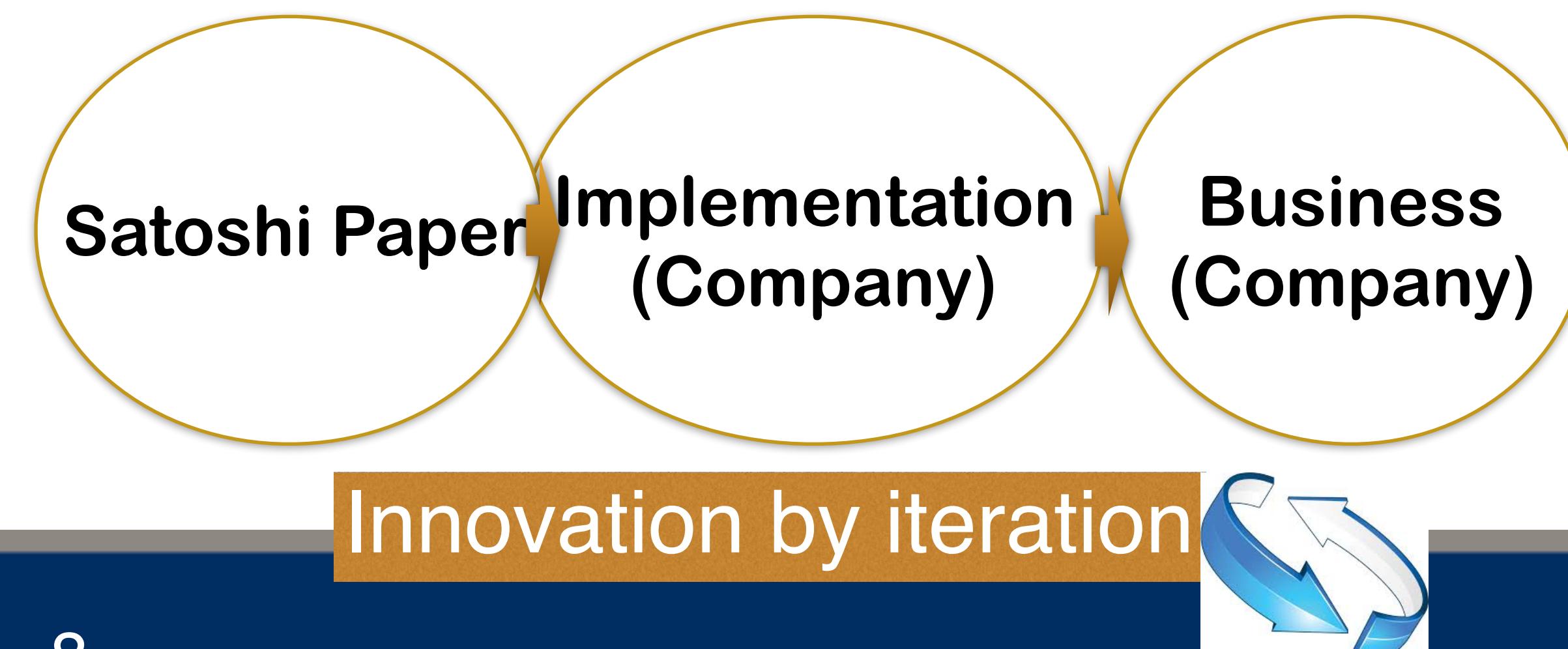
Academic Research is still needed

The Case of Internet Technology

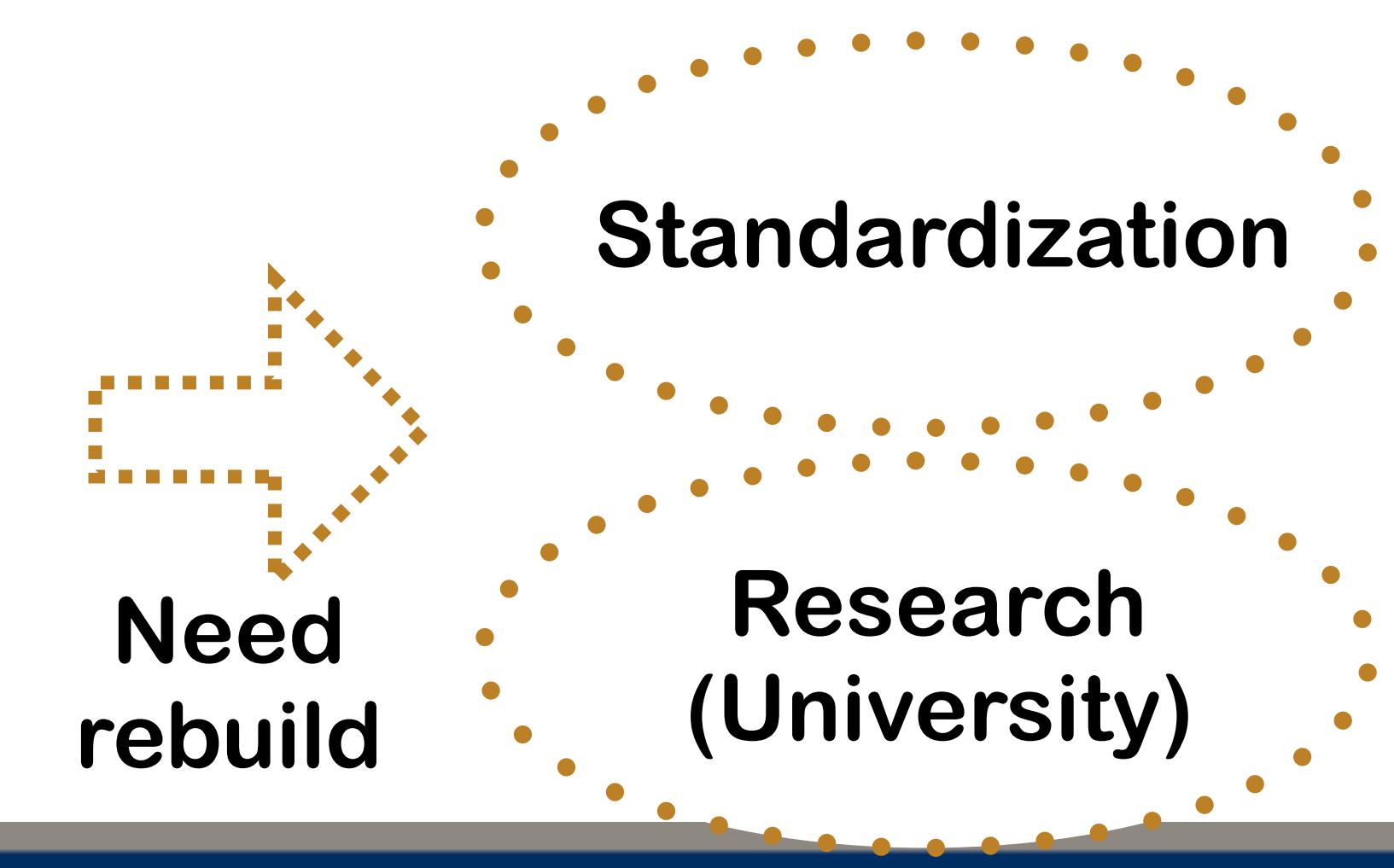


“BSD” and open-source facilitated innovation

The Case of Bitcoin and Blockchain

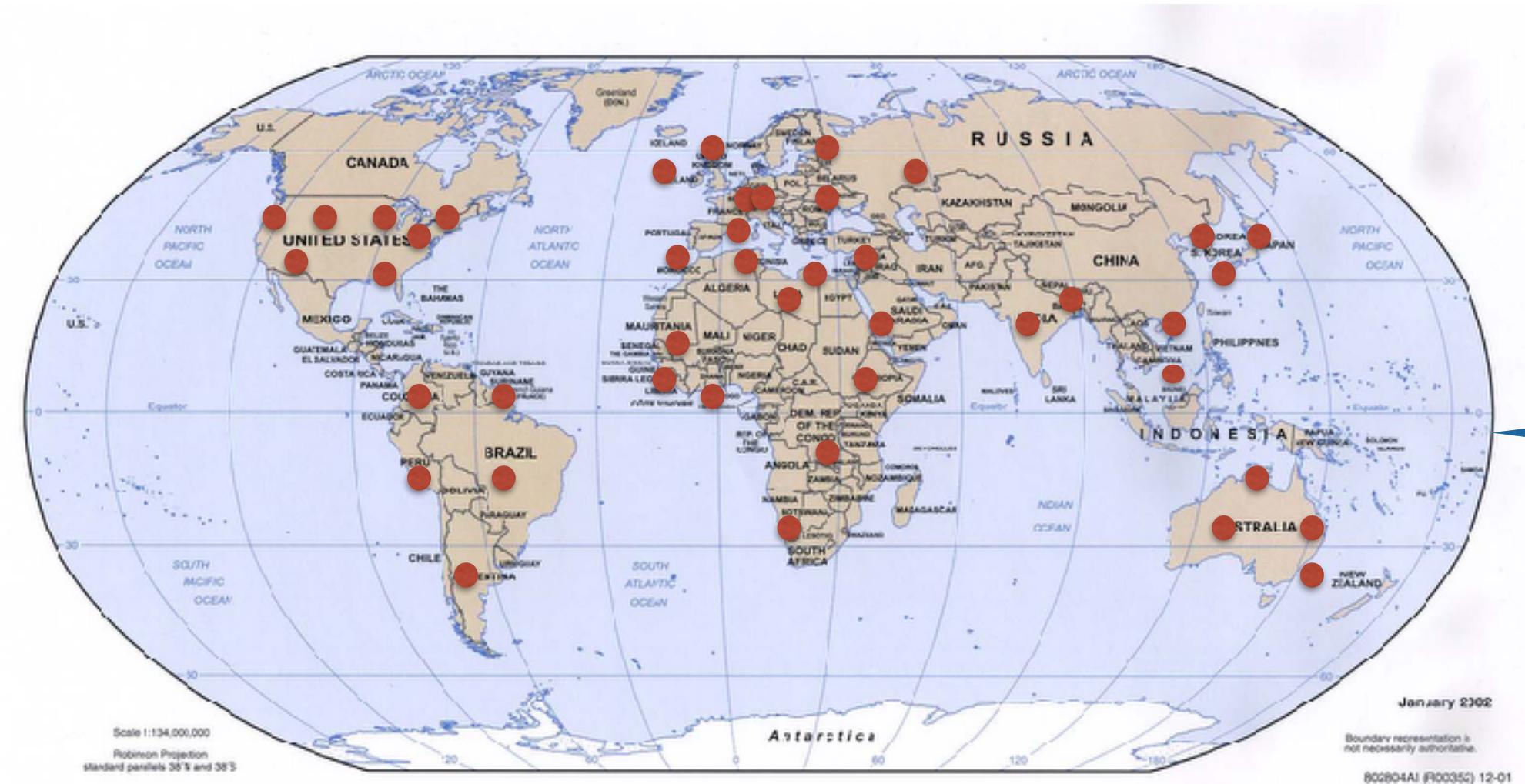


Innovation by iteration



BSafe.network: Plays the same role as NSFNet and BSD

- A **neutral, stable** and **sustainable** research test network for Blockchain technology by international universities.
- Founded by me and Pindar Wong in March 2016. Each university becomes a blockchain node.
- Research on Blockchain and its applications
 - Not limited to Security. All aspects will be researched.



- Neutral platform
- de-anchored trust of Blockchain network
- More nodes (with Neutrality)
- Testbed for academic research

Why is university the good place?

The place for experiments

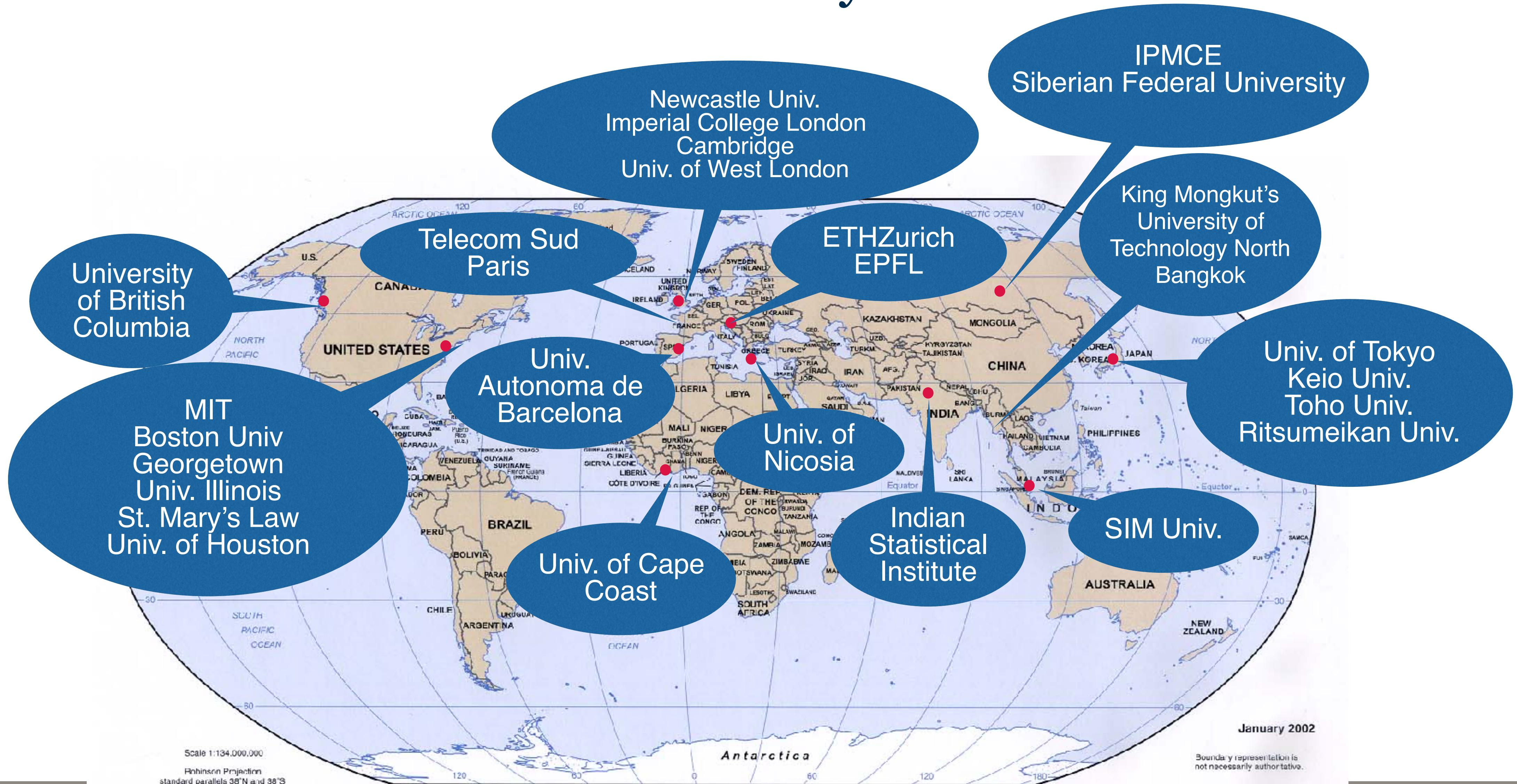
The place of neutrality

The place of diversity

The place of international collaboration

The number of university: > 15K, scalable!

27 International Universities Already Join and We Add More...



Example of Research Project: Sensor Network and Blockchain

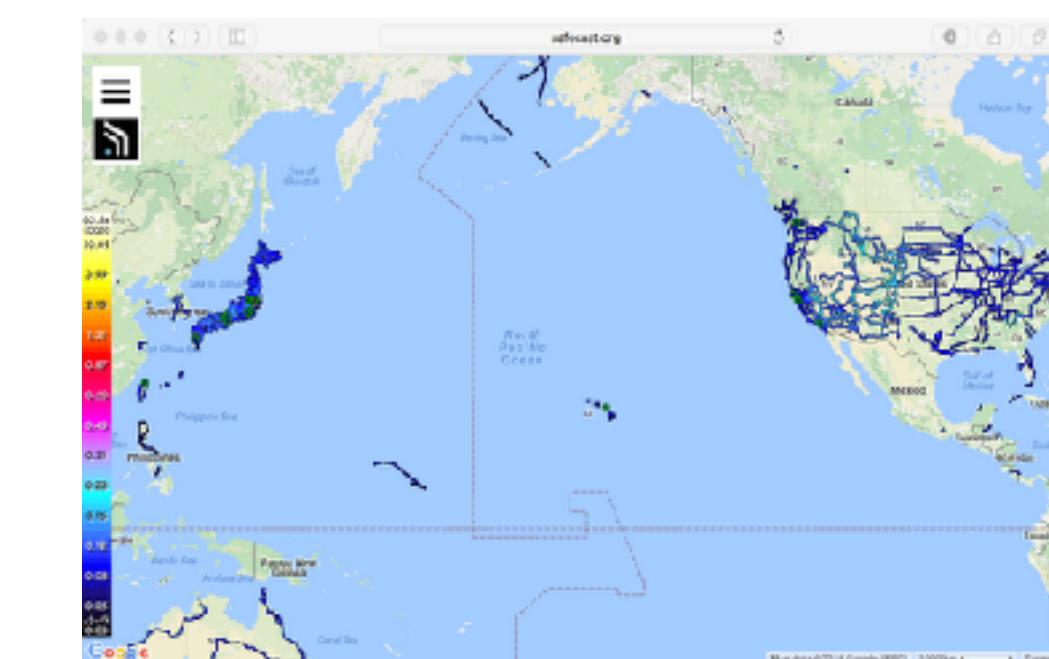
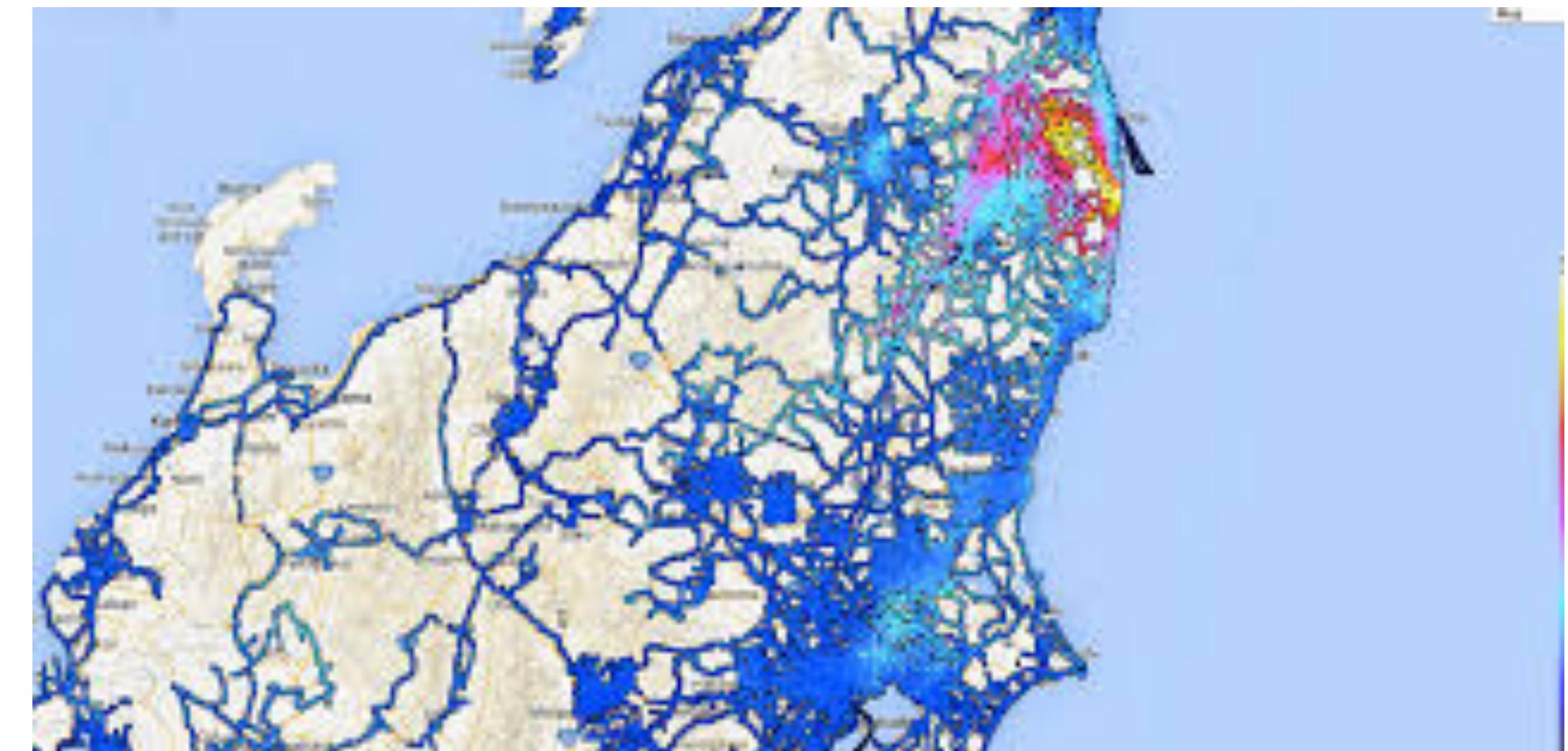
**Collaboration with Safecast:
citizen science project**



**Radiation data from global scale sensor
network**

**Give provenance to the radiation data
with its time and location**

**Share the data over blockchain to
facilitate making new ecosystem**



Example of Research Project: Facilitate Digital Fabrication

Manage code and products for digital fabrication

Attach a RFID tag to products

Facilitate to both trace and trading of products using bitcoin and blockchain

Provenance, trading and payment



Designing Domain Specific Language

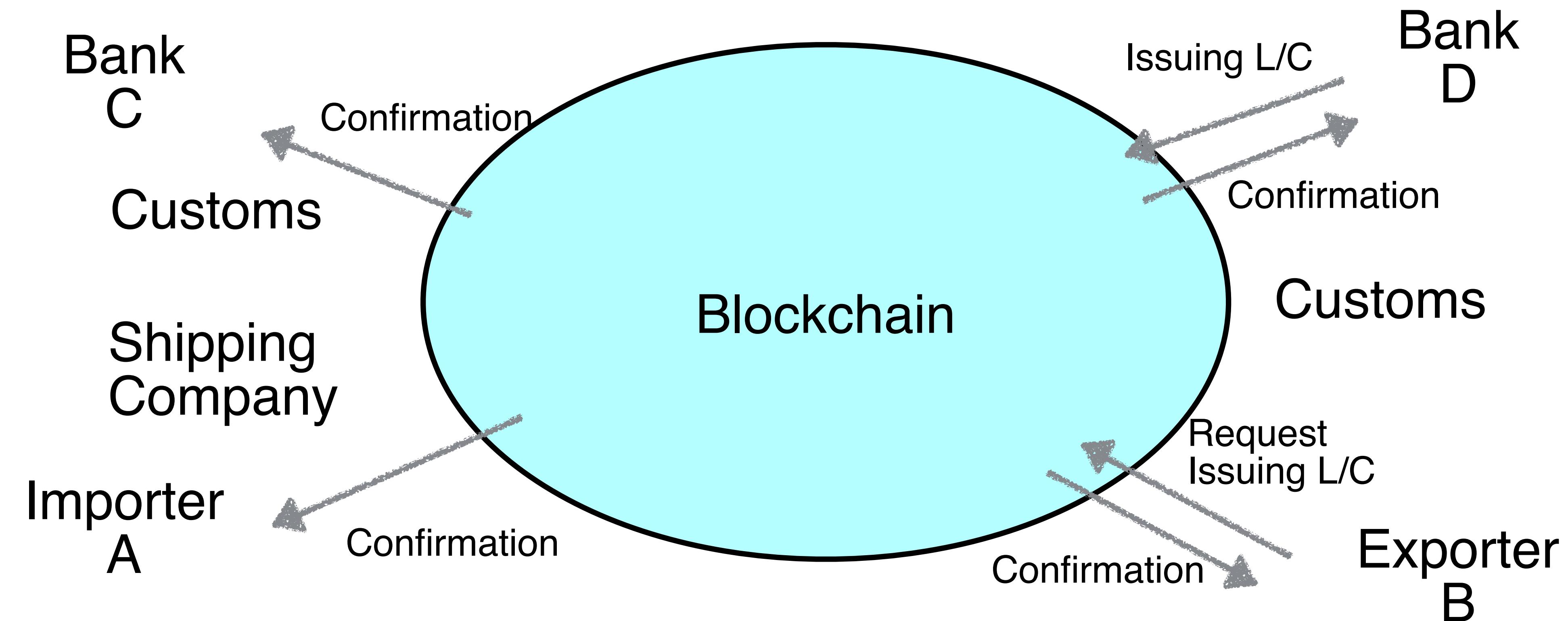
To limit possible execution states, which include “insecure” state, create new domain specific language

Has enough capability to write business logic

Suitable for formal verification

Good tool for communication with regulators

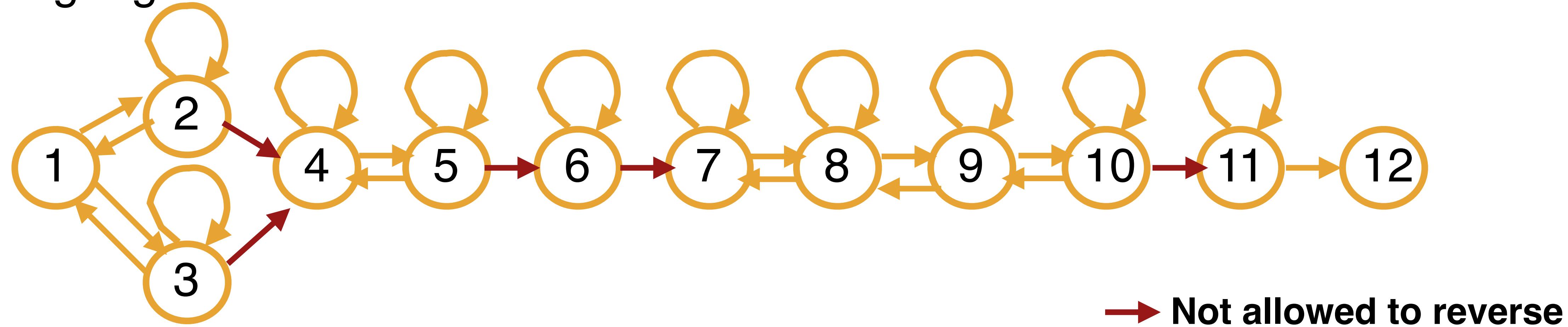
Letter of Credit (L/C) and Trade Finance over Blockchain



State Transitions of common process of L/C

Four variables for state representation: Contract, L/C, Payment, Shipment

Create language and execution environment from state transitions and constraints



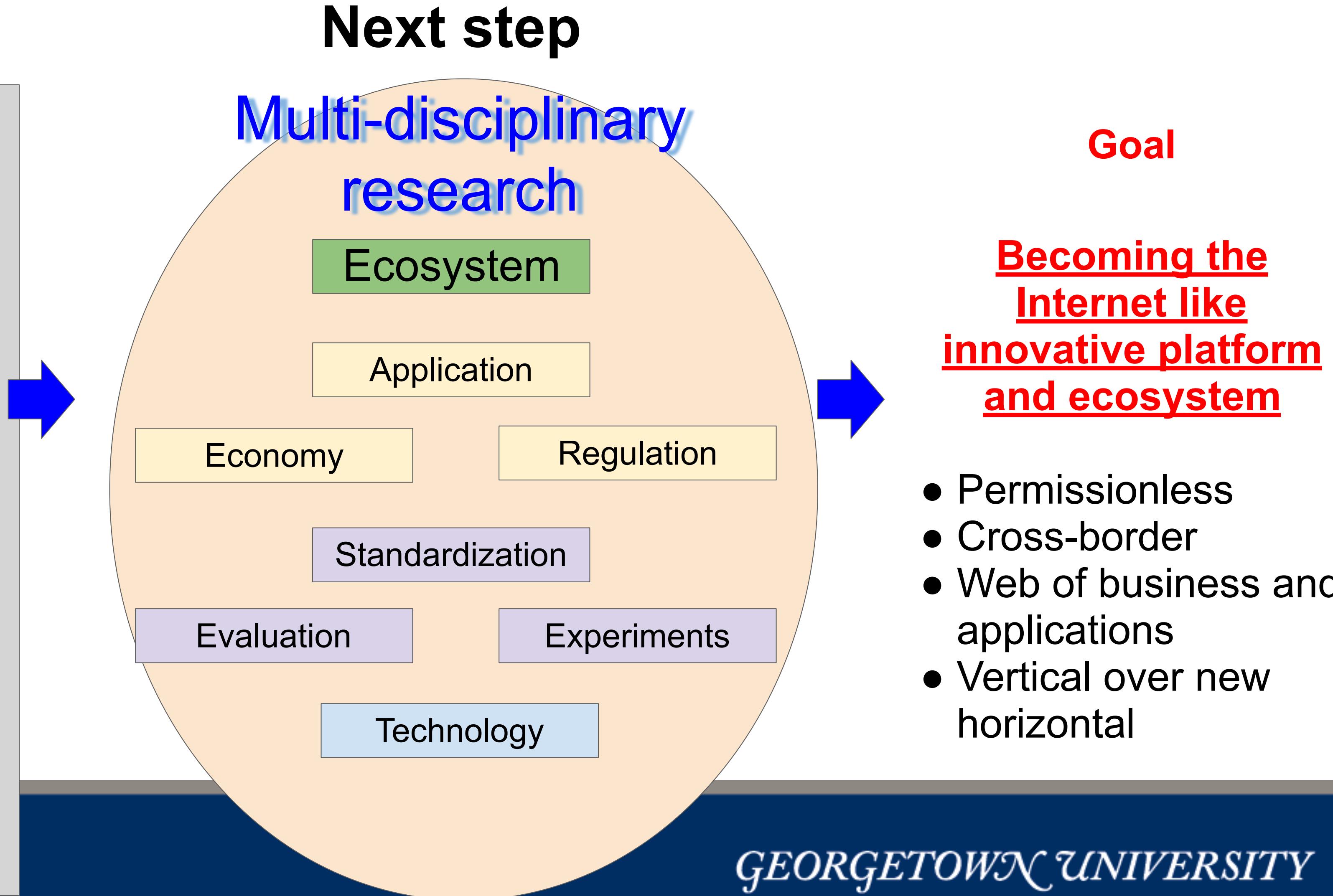
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|----------|------|----------------------|------|------|-----------|-----------|---------------|---------------|---------------|-----------|-----------|-----------|
| L/C | Init | Init | Init | Init | Issue Req | Issue Req | Issued | Issued | Issued | Confirmed | Confirmed | Confirmed |
| Cash | Init | Init | Init | Init | Init | Cash Lock | Cash Lock | Cash Lock | Cash Lock | Cash Lock | Settled | Settled |
| Goods | Init | Init | Init | Init | Init | Init | Init | Shipped | Received | Received | Received | Received |
| Contract | Init | A signed B signed | Both | Both | Both | Both | Both | Both | Both | Both | Both | Fin |

The next step of Blockchain R&D

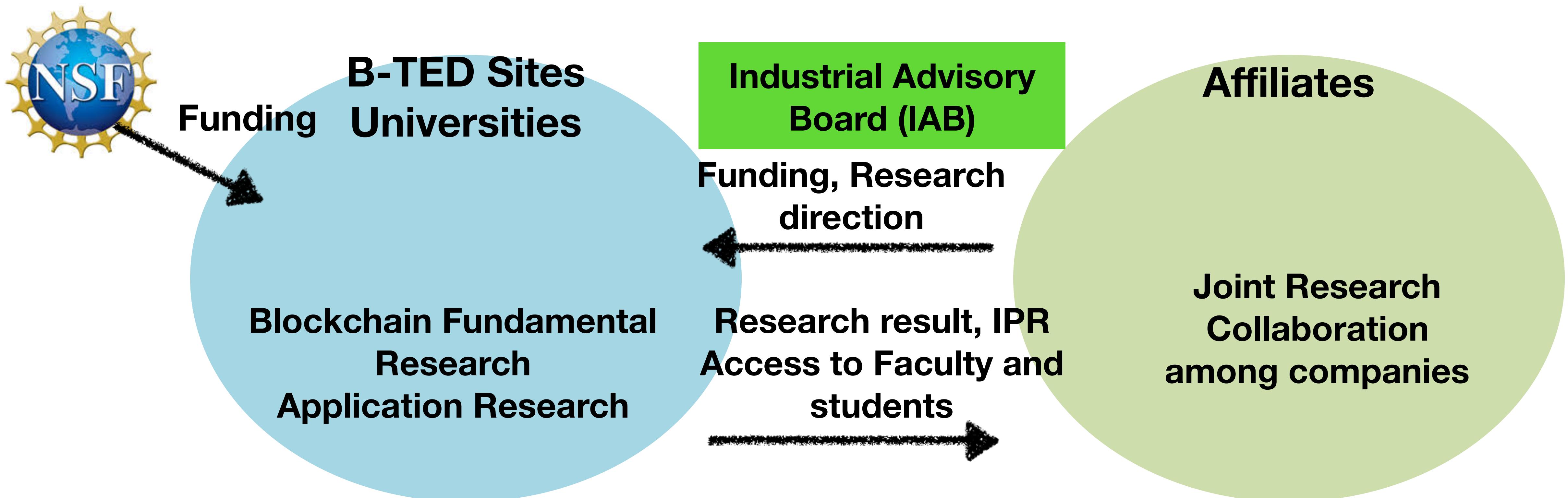
From tons of experiments to new ecosystem design

- 2017

- Tons of experiments to seek use cases
 - Few use cases with utilizing merit of public blockchain
 - Limitation of technology
- Gap between expectation and real
- Regulation Issues
 - ICO
 - Much scams
- Governance of public blockchain
 - Bitcoin scalability
 - Many forks and chaos
- Many less-focused consortiums



Blockchain Technology and Ecosystem Design (B-TED) Research Center



Goals of B-TED

- Be a trusted Industrial - academic research platform and anchor
 - NSFNet and BSD for Blockchain
 - Provide independent, academic and neutral evaluation criteria for Blockchain technology
- Provide research results and IPR to Affiliates
 - Multi-disciplinary research, International connection
 - Technology and ecosystem design: tech, economics, legal and connection to industry, government and regulators
 - Applications and its deployment
- Contribution to Standardization
 - IETF, ISO, IEEE, etc.

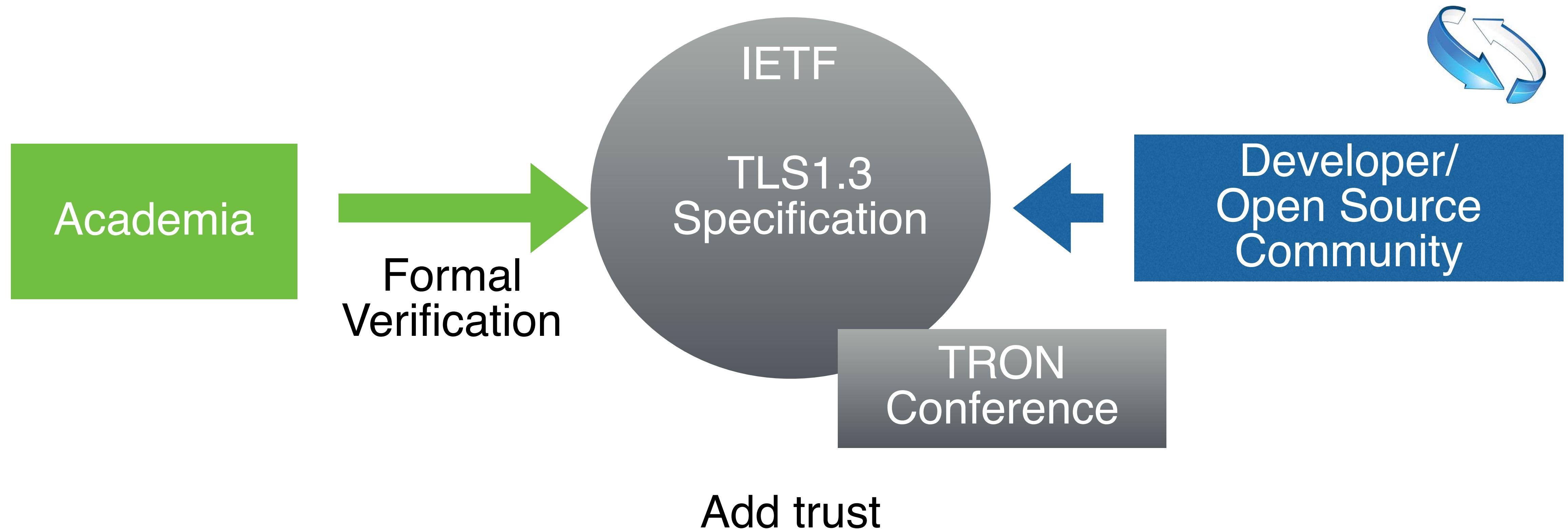
Member Universities

- Georgetown University (Leader)
- University of Houston
- University of Central Florida
- and more ...

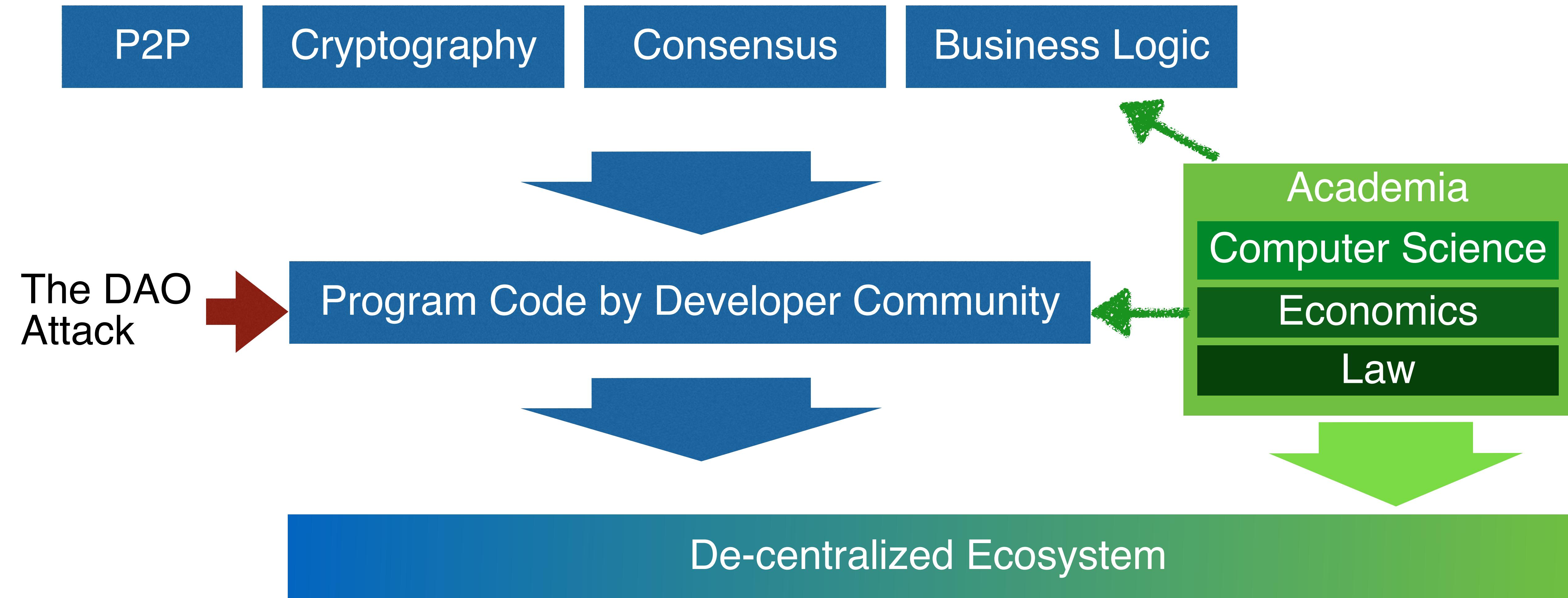
Examples of research projects

- Foundation of Blockchain
 - Evaluation -> Common criteria for Due-diligence
 - Game Theory and security economics
 - Open Source Community organization
- Applications of Blockchain
 - New forms of finance and economy
 - Blockchain x Security
 - Blockchain x Supply Chain and Logistics
 - Blockchain x IoT, Fog
 - Blockchain x Medical Record and Insurance

Practice from the Development of TLS1.3



Decentralization by Diversity



**Academia is the essential part of diversity, and
it makes bitcoin/blockchain ecosystem healthy.**

Thank you!



GEORGETOWN UNIVERSITY



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