



Long Finance & Distributed Futures

Long Finance Autumn Conference 2018 Smart Ledgers & Risk

Wednesday, 14 November 2018, London

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<http://www.distributedfutures.net>

@LongFinance (#DistributedFutures)

Smart Ledgers & Risk

Welcome!



Professor Michael Mainelli
Executive Chairman, Z/Yen Group



Sponsored By



The Z/γen Group



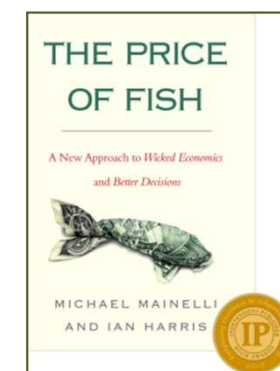
The Financial
Services Club

Agenda

- 09:00 - 09:15 **Welcome, Introduction & Background**
Professor Michael Mainelli, Executive Chairman, Z/Yen Group
- 09:15 - 09:30 **Initial Coin Offerings – The Search For The Final Function**
Ian Dowson, Principal, William Garrity Associates
- 09:30 - 10:00 **Cyber-Catastrophe Insurance-Linked Securities On Smart Ledgers**
Sam Carter, Financial Services Researcher and Quant Developer
- 10:00 - 10:30 **Coffee Break and Networking**
- 10:30 - 11:00 **Smart Jurisdictions Index**
Mike Wardle, Greg Williams, Z/Yen Group
- 11:00 - 11:30 **Information Rules: Smart Ledger Architectures & Distributed Permissions**
Maury Shenk, Managing Director, Lily Innovation
- 11:30 - 12:00 **Panel Discussion and Questions**
- 12:00 - 12:15 **Summing Up & Next Steps**



- ◆ Special – City of London’s leading commercial think-tank
- ◆ Services – projects, strategy, expertise on demand, coaching, research, analytics, modern systems
- ◆ Sectors – technology, finance, voluntary, professional services, outsourcing
 - Independent Publisher Book Awards Finance, Investment & Economics Gold Prize 2012 for *The Price of Fish*
 - British Computer Society **IT Director of the Year** 2004 for PropheZy and VizZy
 - DTI **Smart Award** 2003 for PropheZy
 - *Sunday Times* Book of the Week, *Clean Business Cuisine*
 - £1.9M **Foresight Challenge Award** for Financial Laboratory visualising financial risk 1997



Distributed Futures Programme



We work in partnership with many stakeholders to learn together and build the vital infrastructure needed to make Smart Ledgers a success.

Our research is structured around four themes:

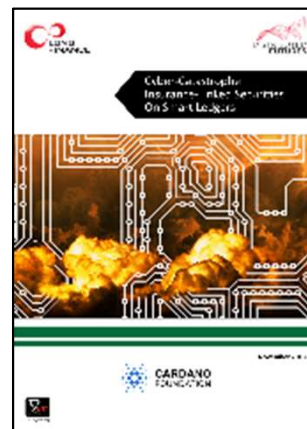
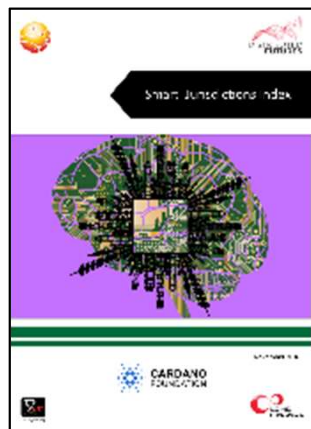
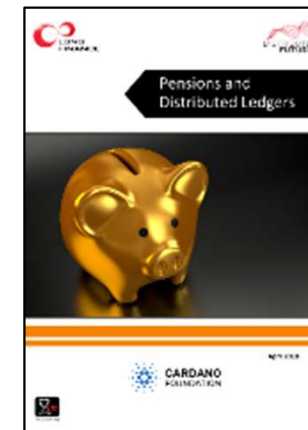
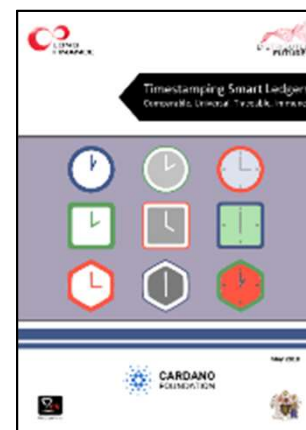
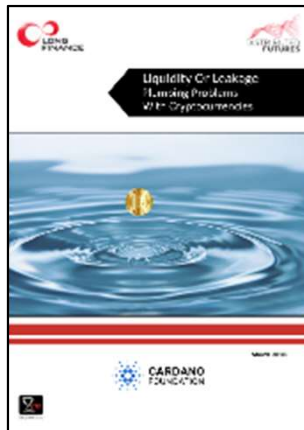
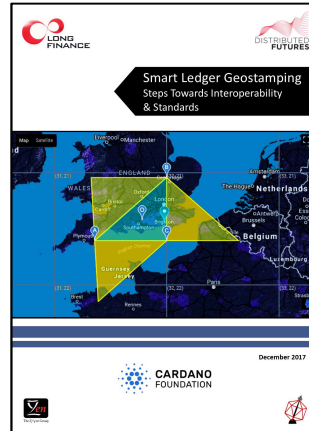
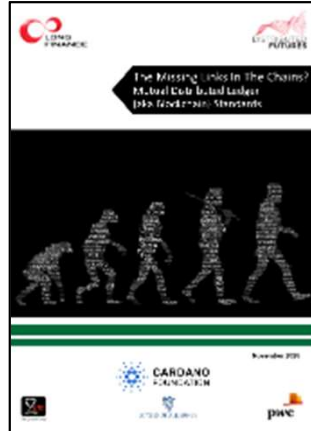
- ◆ Society
- ◆ Technology
- ◆ Economics
- ◆ Politics

And is directed at four outcomes:

- ◆ Expanding frontiers
- ◆ Changing systems
- ◆ Delivering services
- ◆ Building communities

www.distributedfutures.net

Distributed Futures Research



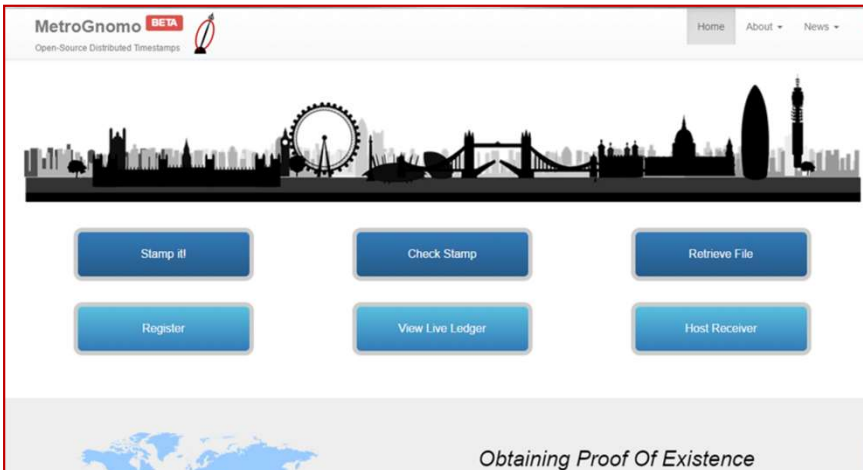
Terminology Evolving

- ◆ **ledger** – a record of transactions
- ◆ **distributed** – divided among several or many, in multiple locations
- ◆ **mutual** – shared in common, or owned by a community
- ◆ **mutual distributed ledger (MDL)** - a record of transactions shared in common and stored in multiple locations
- ◆ **mutual distributed ledger technology** – a technology that provides an immutable record of transactions shared in common and stored in multiple locations
- ◆ **blockchain** - “a transaction database shared by all nodes participating in a system based on the Bitcoin protocol”
- ◆ **smart ledger** – MDL with embedded, executable code



Smart Ledgers Hold Immense Promise

Financial Instruments, Records, Models		Public Records		Private, Semi-Private/Semi-Public		Physical Keys, Intellectual Property, Other Records	
Currencies	Derivatives	Land & Property Titles	Vehicle Registries	Contracts	ID	Home Key	Hotel Key
Commodities	Insurance Policies	Shipping Registries	Satellite Registries	Signature	Will	Office Key	Car Key
Trading Records	Private and Public Equities	Business License	Business Ownership Records	Trust	Escrow	Deposit Box Key	Mail Box Key
Certificates of Deposit	Bonds	Incorporation / Dissolution Records	Regulatory Records	Other Classifiable Data	High School / University Degrees	Internet Of Things	Copyrights & Patents
Voting Rights (Financial Services)	Credit Data	Criminal Records	Passport	Professional Qualifications	Certifications	Licenses	Digital Rights Management
Collateral Management	Client Monies Segregation	Birth / Death Certificates	Voting ID	Human Resources Records	Medical Records	Trademarks	Proof Of Authenticity / Authorship
Mortgage / Loan Records	Crowd-Funding	Health & Safety Inspections	Tax Returns	Accounting Records	Business Transaction Records	Cultural Events	Historical Events
P2P Lending	Microfinance	Building & Other Types Of Permits	Court Records	Locational Data	Genome & DNA	Documentaries	Big Data
Account Portability	Airmiles / Corporate Tokens	Government / Listed Companies	Accounts & Annual Reports	Arbitration	Genealogy Trees	SIM Cards	Archives

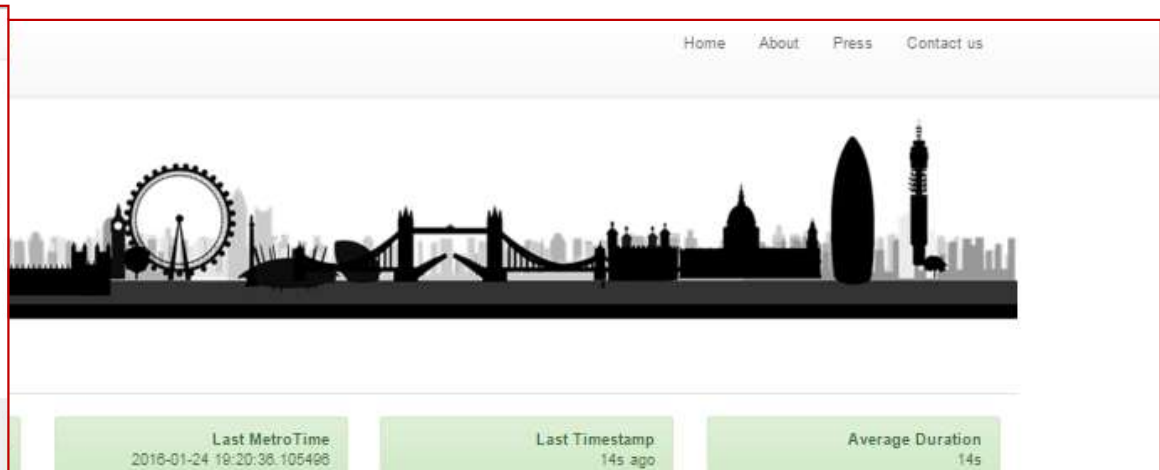



MetroGnomo **BETA** Open-Source Distributed Timestamps

Home About News

Stamp it! Check Stamp Retrieve File Register View Live Ledger Host Receiver

Obtaining Proof Of Existence

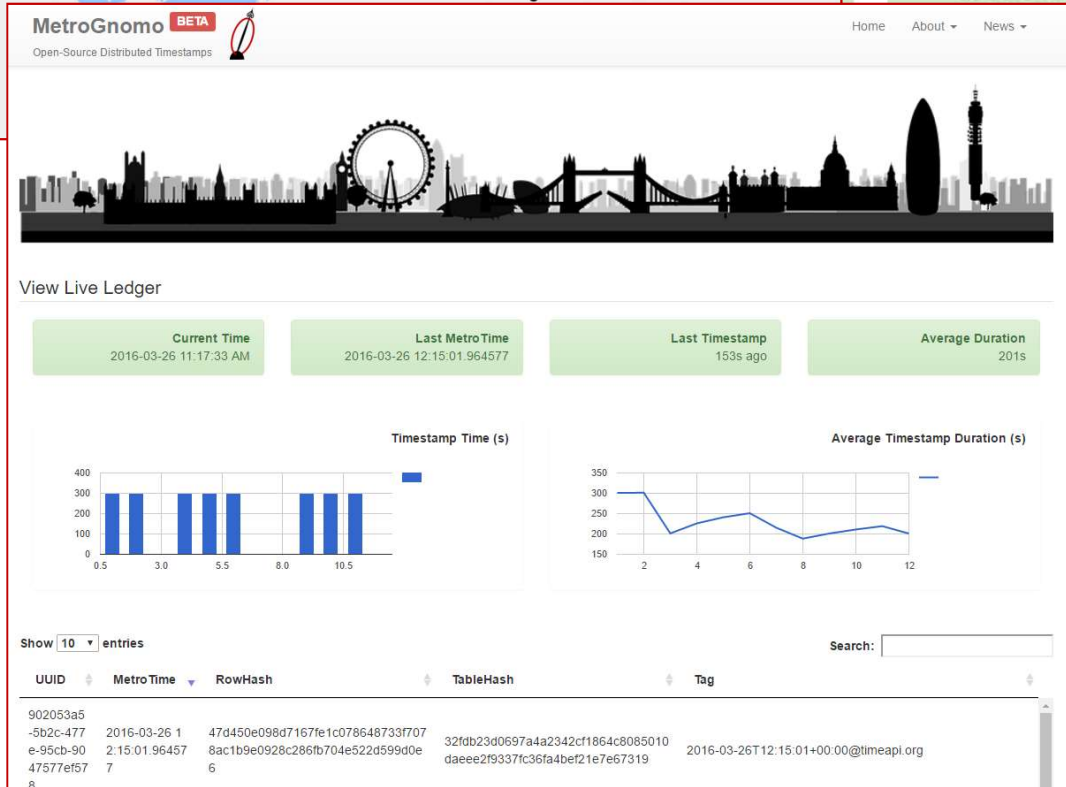


Home About Press Contact us

Last MetroTime: 2018-01-24 19:20:36.105498

Last Timestamp: 14s ago

Average Duration: 14s



MetroGnomo **BETA** Open-Source Distributed Timestamps

Home About News

View Live Ledger

Current Time: 2016-03-26 11:17:33 AM

Last MetroTime: 2016-03-26 12:15:01.964577

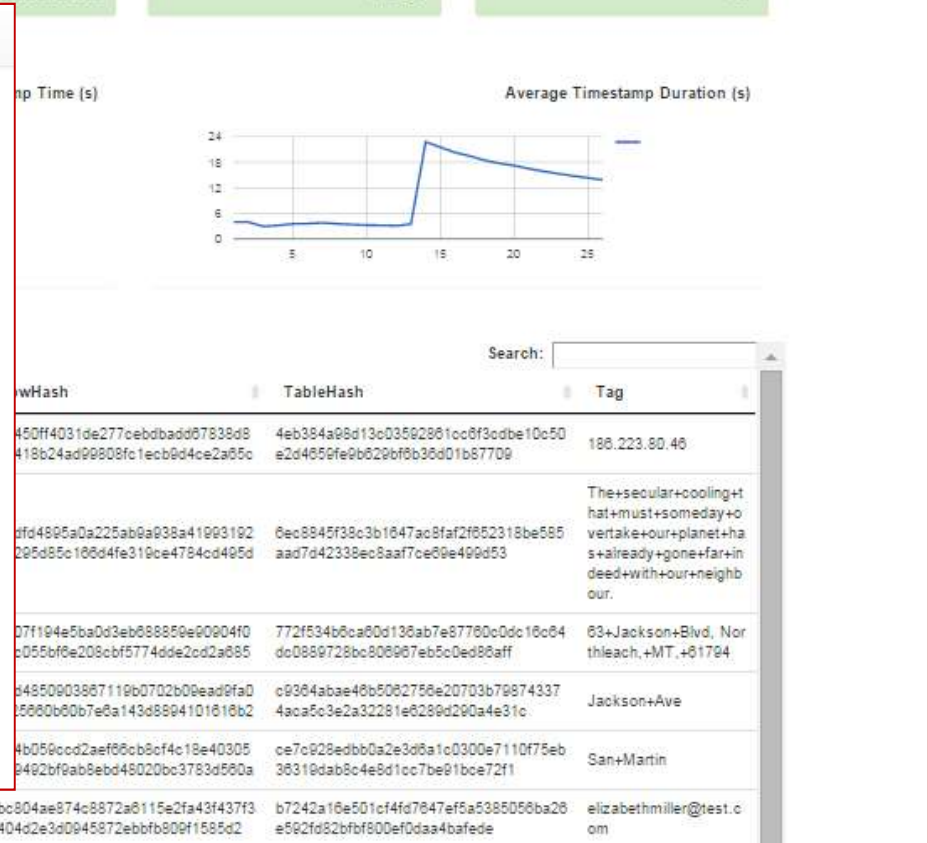
Last Timestamp: 153s ago

Average Duration: 201s

Timestamp Time (s) and Average Timestamp Duration (s) charts

Show 10 entries

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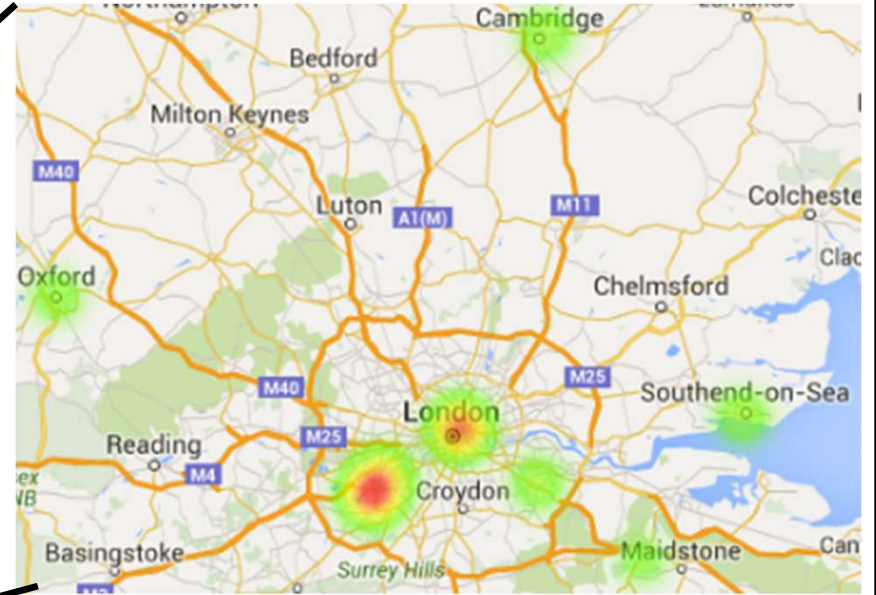
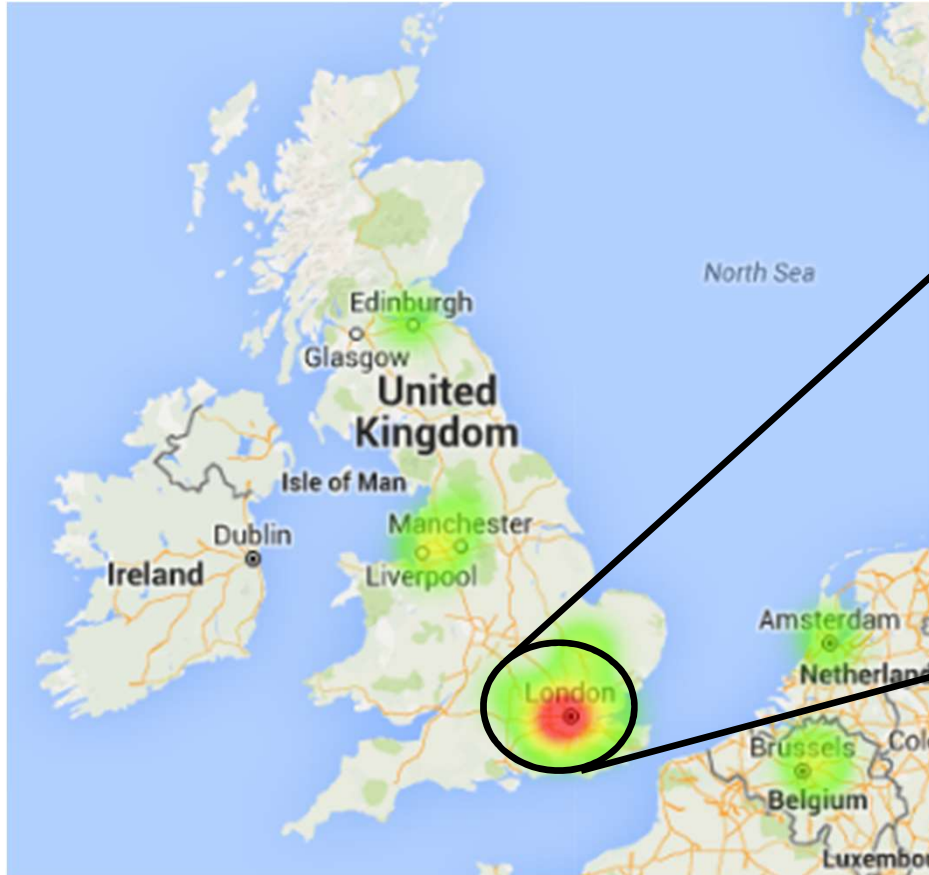


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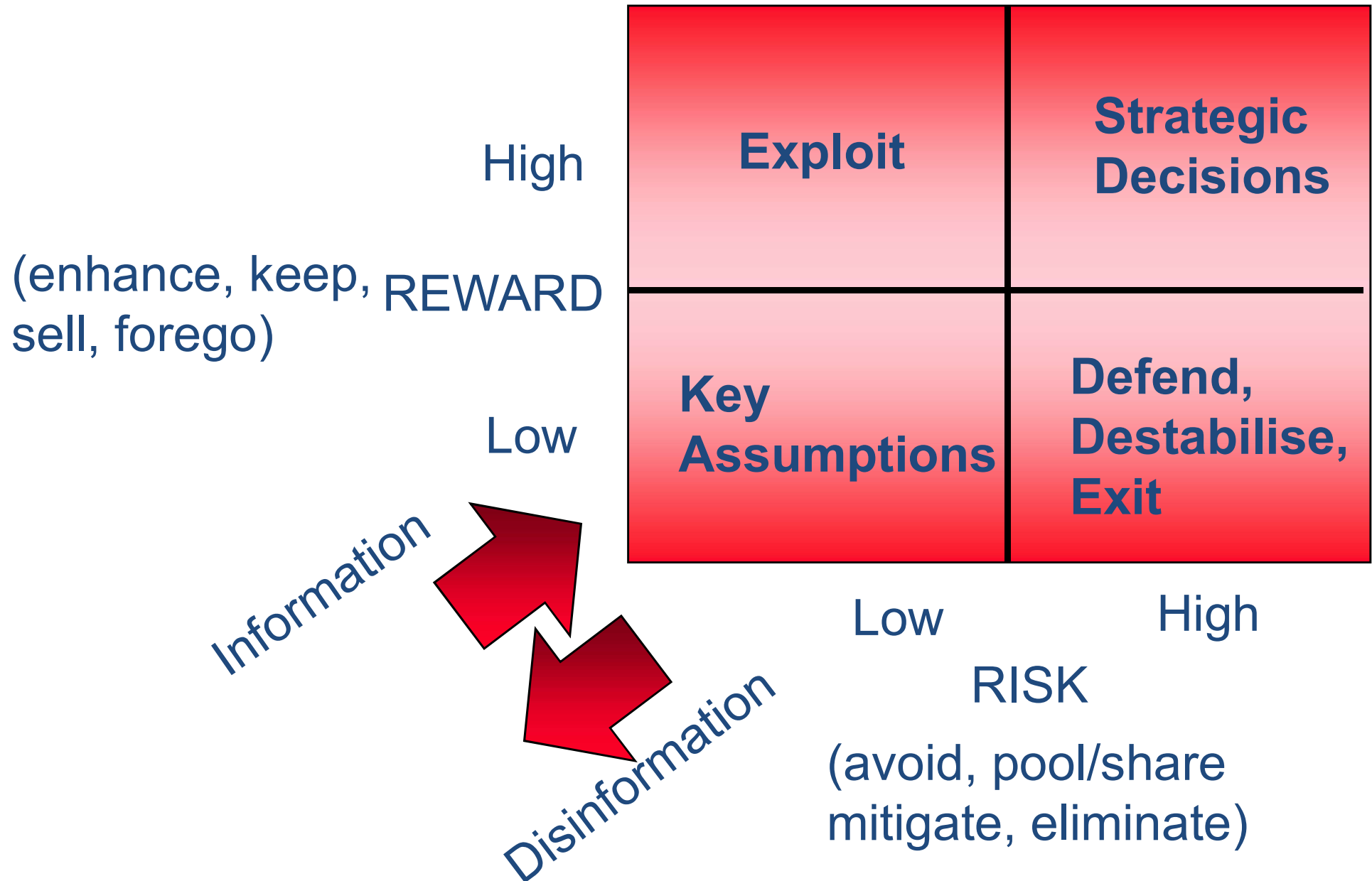
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4b059ccd2aef86cb8cf4c18e40305 9492bf9ab8ebd48020bc3783d560a	ce7c928edbb0a2e3d6a1c0300e7110f75eb 36319dab8c4e8d1cc7be91bce72f1	San+Martin

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Application: Clinical Trials



Generic Risk/Reward Profiles



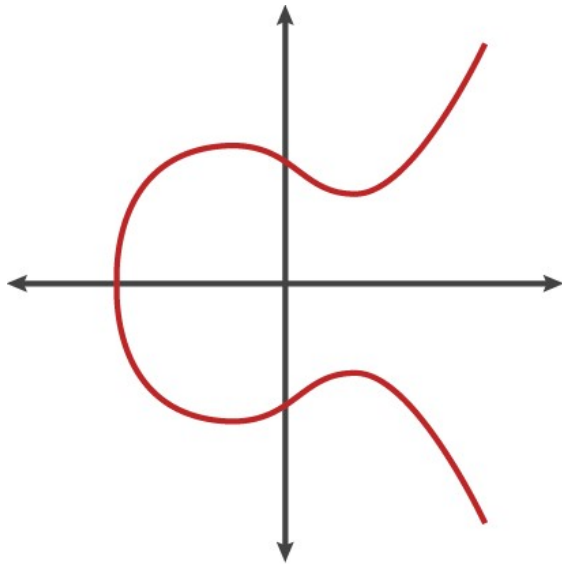
The Search For The Final Function



Ian Dowson

Principal, William Garrity Associates

ICOs



The Search for the Final Function

Long Finance
14 November
2018

IC Dowson
William Garrity
Associates Ltd
@iand47

Three Phases of Fintech

Funded Angel,
VC PE, Corporate

End point to End point
Driven by
Loans and
Traditional
Payment
Infrastructure

Funded Angel,
VC PE, Corporate

Cloud Platforms
capture
process
transaction
discovery
Delivery Bots
& RPA

Funded Angel,
VC PE, Corporate
and from
Ecosystem
Network

Global Network of Ecosystems
Mediated or
Unmediated
Powered by AI Deep
Learning Blockchain
based P2P networks
Payment, Process,
Identity, Security,
Transparency,
Discovery integrated

Phase 1 –
Disintermediation

Year 8

\$79bn

Phase 2 –
Transactions Process & Platform

Year 5

\$62.2bn

Phase 3 –
Systemic change
Global Eco Systems

Year 0

\$3.6bn + ICO's

ICOs

r3.

Blockchain Type DLT

100+ Banks



HYPERLEDGER

170 members

Unity Settlement Coin USC

Barclays, CIBC, Credit Suisse, HSBC, MUFG and State Street, UBS, BNY Mellon, Deutsche Bank, Santander, NEX Clearmatics.

J.P. MORGAN INTERBANK INFORMATION NETWORKSM EXPANDS TO MORE THAN 75 BANKS

Largest number of banks to join live application of blockchain technology

Case for

Straight Through Processing

Benefit

Becoming established

We.trade (Digital Trade Chain)

KBC, Deutsche Bank, HSBC, Natixis, Rabobank, Société Générale, UniCredit, Santander

Digital Asset Holdings

15 major investors – ANB Amro, Accenture, ASX, BNP, Broadridge, CITI, CME, Deutsche Borse, DTCC, Goldman Sachs, IBM, JP Morgan, NEX, PMC, Santander

ripple 29 Investors –

Accenture, Andreessen Horwitz, CME, Core Innovation Capital, Google Ventures, Santander, SBI Group, Digital Ventures, Segate, Standard Chartered. c200 Banks

BBVA signs world-first blockchain-based syndicated loan arrangement with Red Eléctrica Corporación

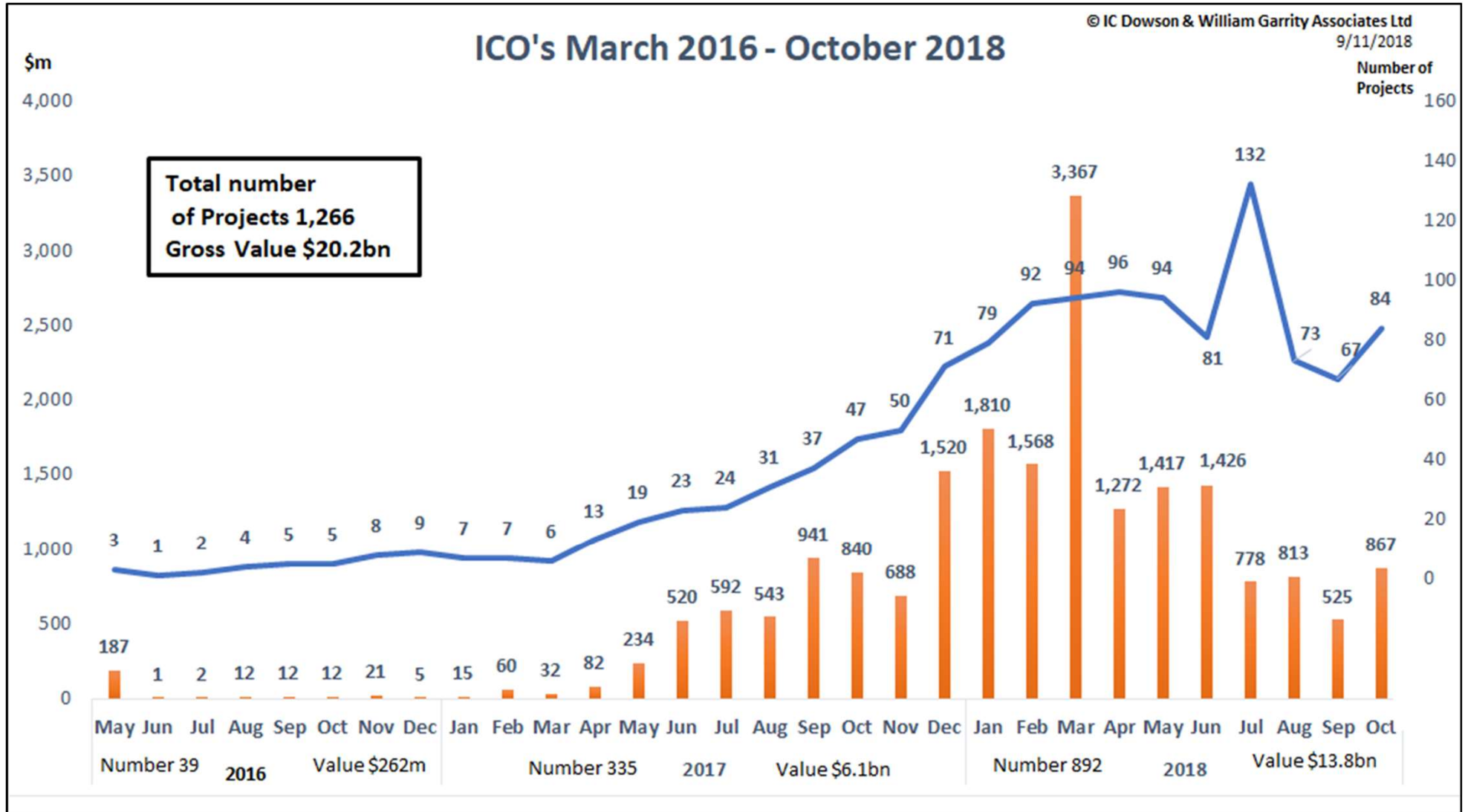


211

Members

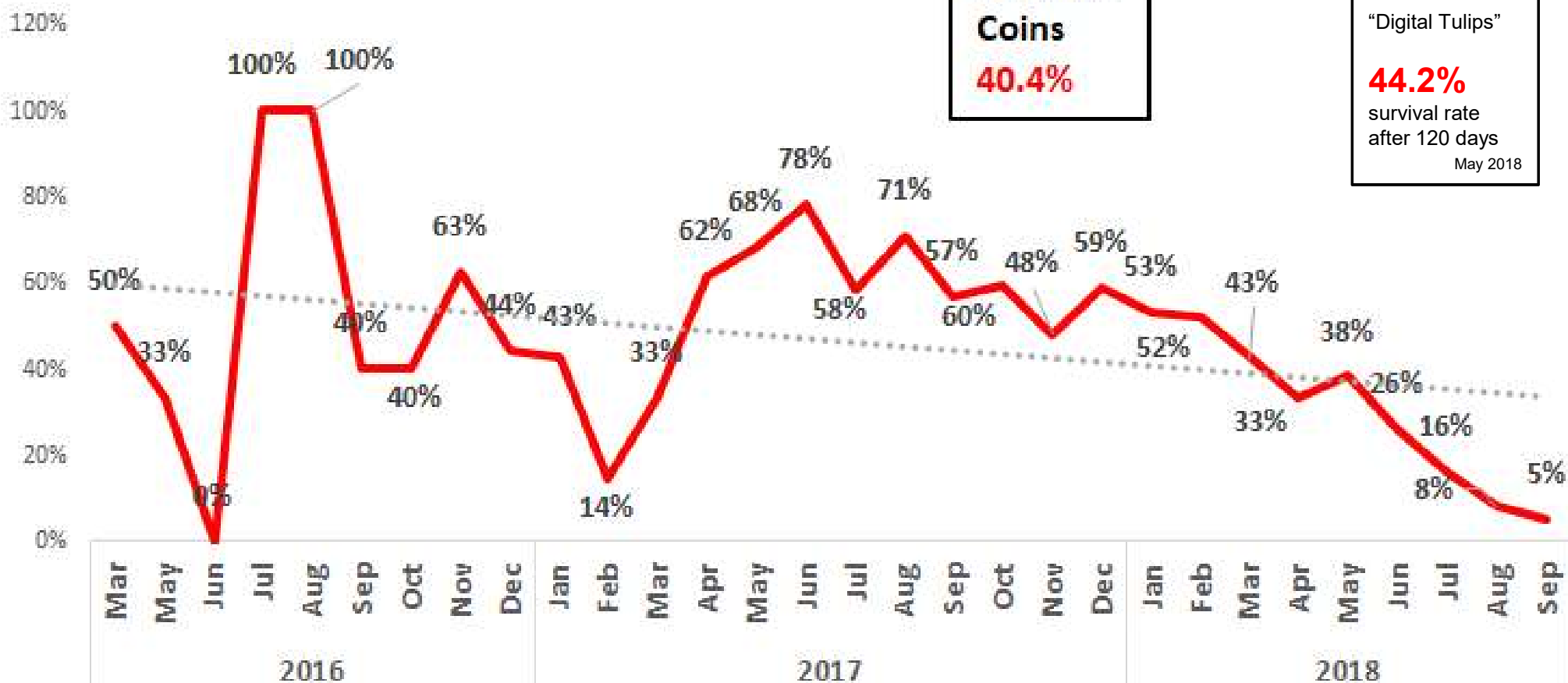


ICOs



ICOs

Tradable Coins Tokens observed % of ICO's

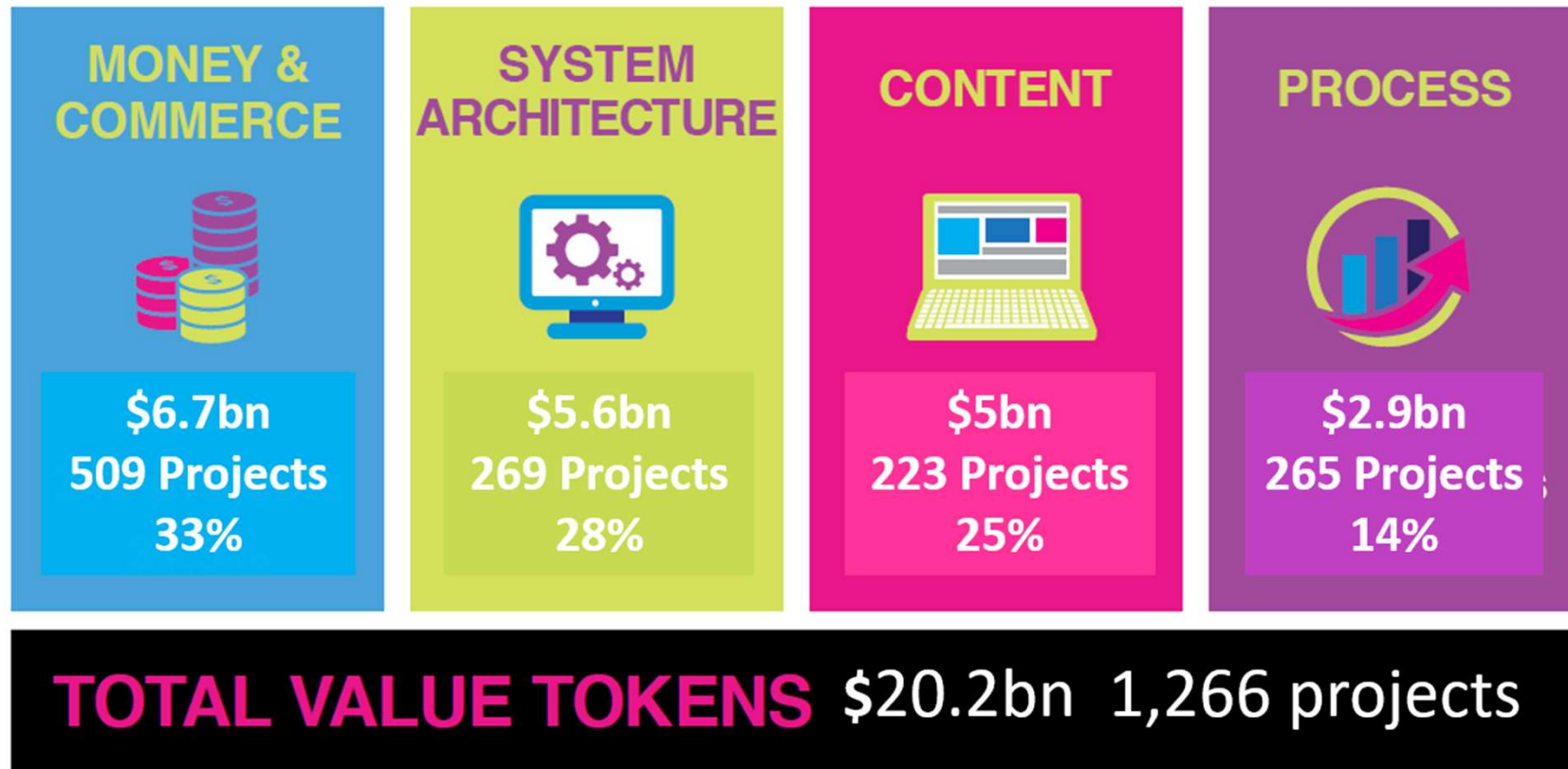


Total Tradable Coins
40.4%

BOSTON COLLEGE
Carroll School of Management

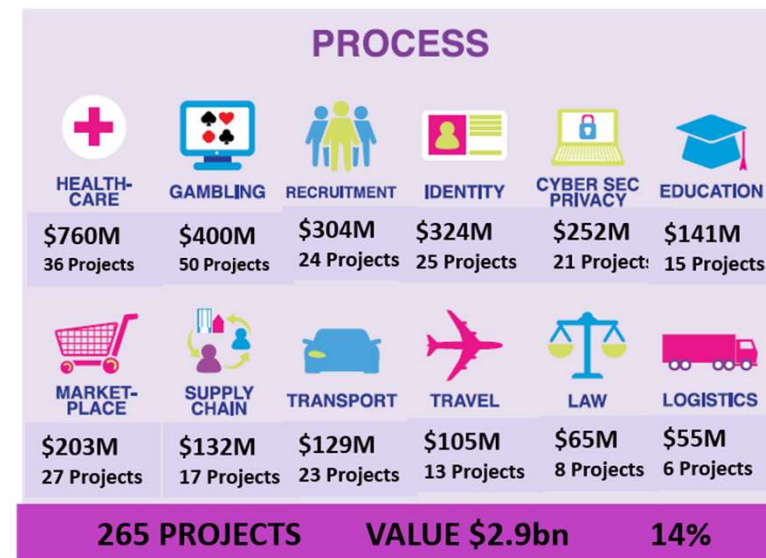
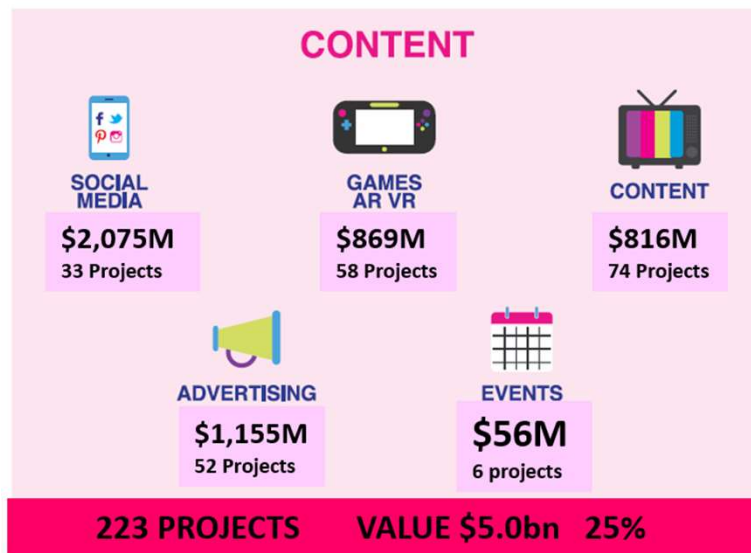
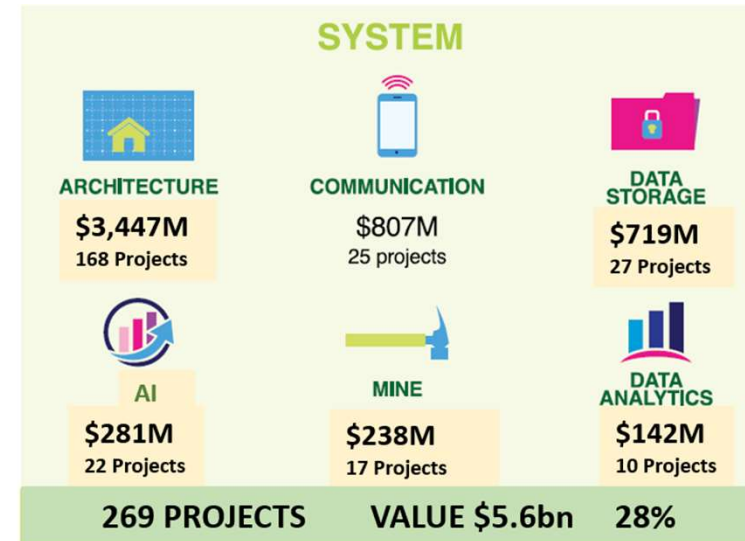
7Benedetti and Kostovetsky
"Digital Tulips"
44.2%
survival rate after 120 days
May 2018

It's the Function – The Business Model that's Important



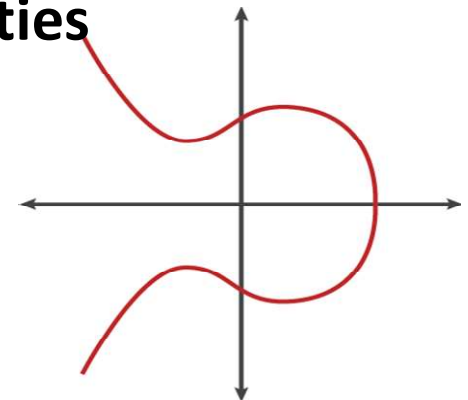
Note: figures End Oct 2018

ICOs



ICOs - Conclusions

- ◆ Function not Form
- ◆ Experimental MVP's maybe \$2-\$6bn of external 3rd party cash
- ◆ Hybrid financing Combinations emerging
 - VC/Angels equity and tokens listed Overstock SCO (Security Coin Offering)
- ◆ It goes beyond the coin:- Payment, Process Automation, Place provenance and data, Protocol, P2P connectivity, Permissions, Assets tokenised or utilised/shared.
- ◆ Coins/Tokens a new form of mutual economic agency ?
- ◆ **It's the Ecosystem behaviour, Communities, Networks, Trust, flipped Business Models, not Technology or Securities**



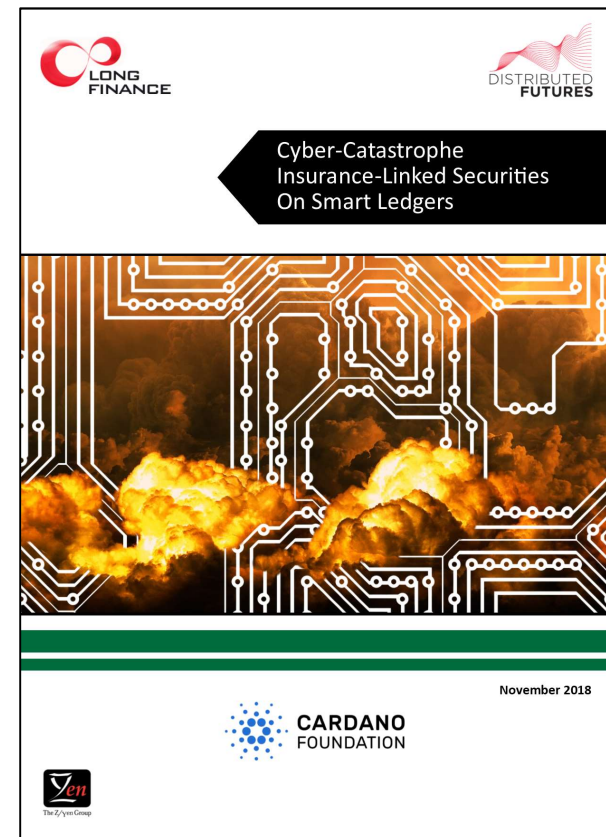


Report Walkthrough & Demonstration

Cyber-Catastrophe Insurance-Linked Securities On Smart Ledgers



Sam Carter
*Financial Services
Researcher and Quant
Developer*



Summary



Evolution



Catastrophe Bonds



Cyber Risk

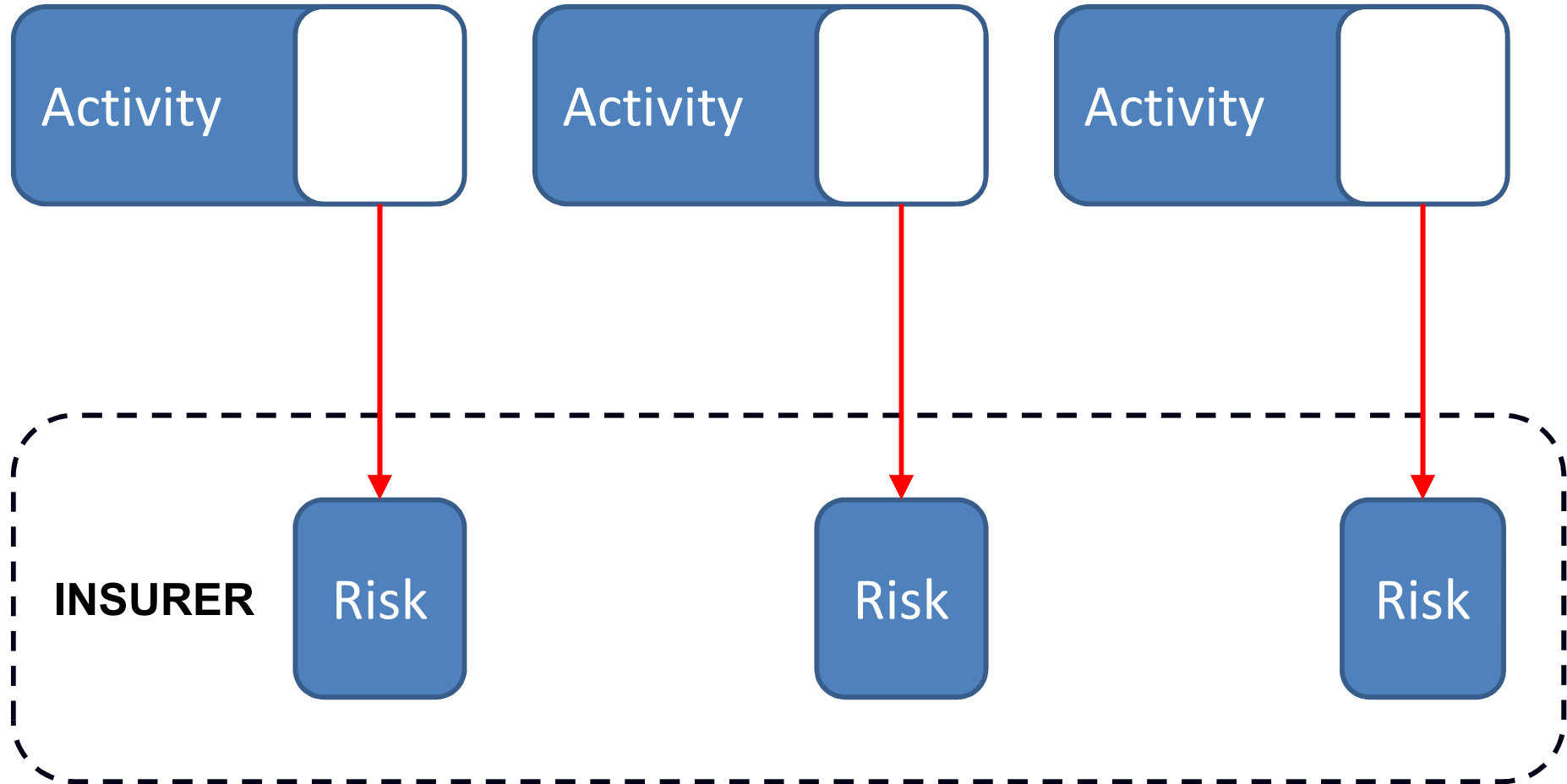


Cyber-Cat and ILSs

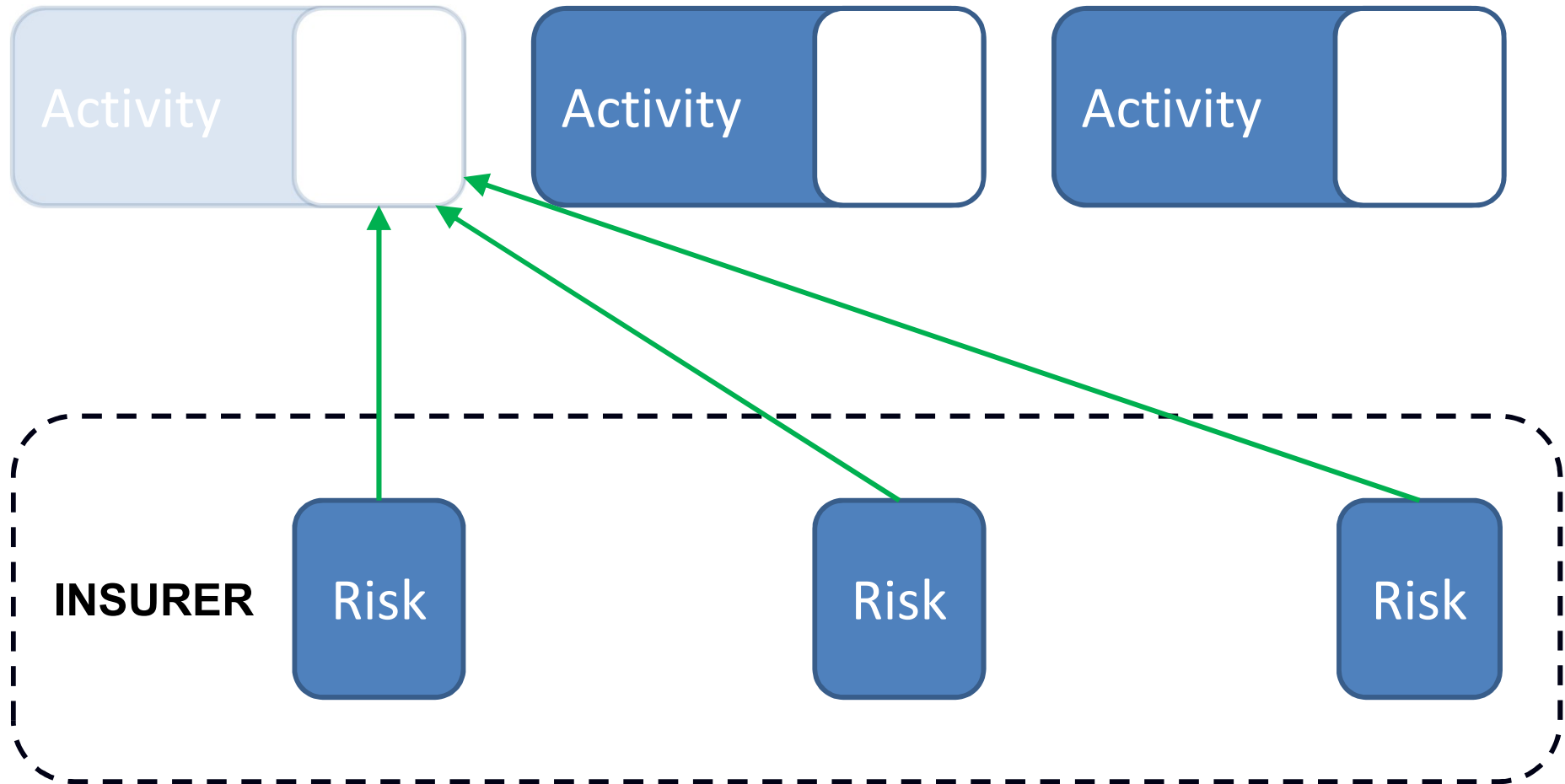


Demo

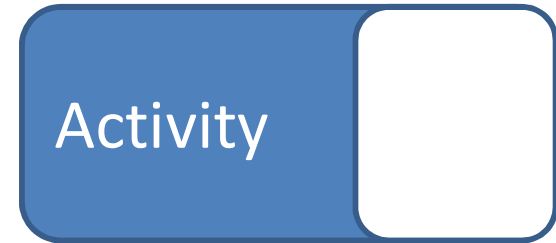
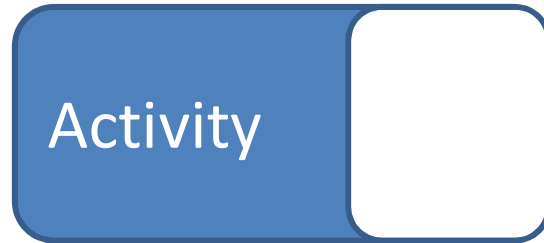
Risk



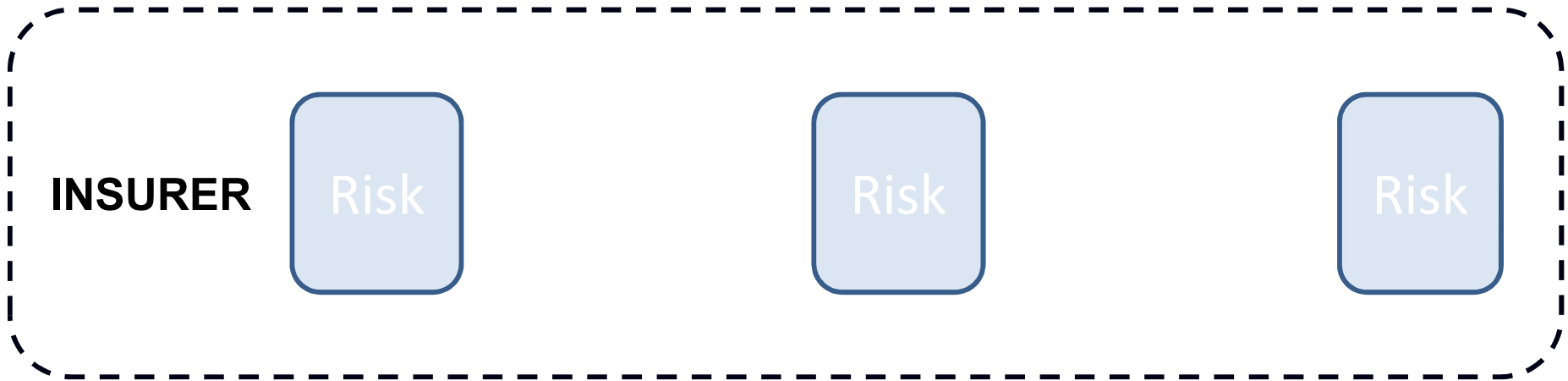
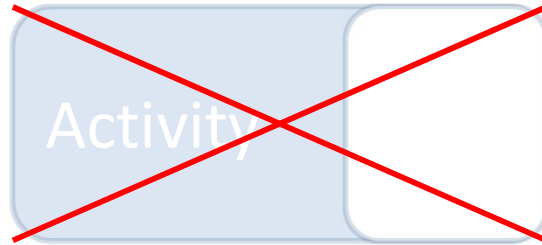
Risk



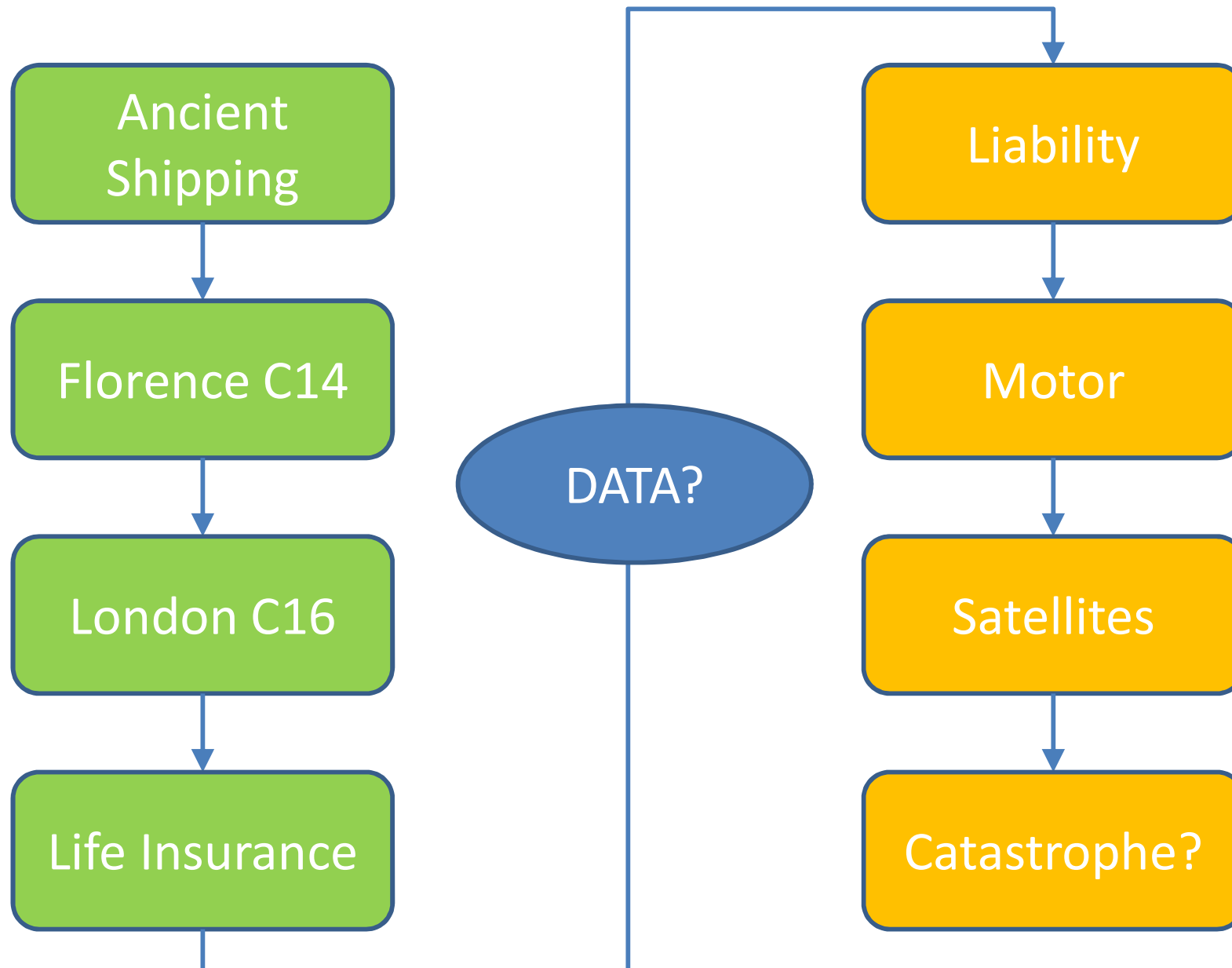
Risk



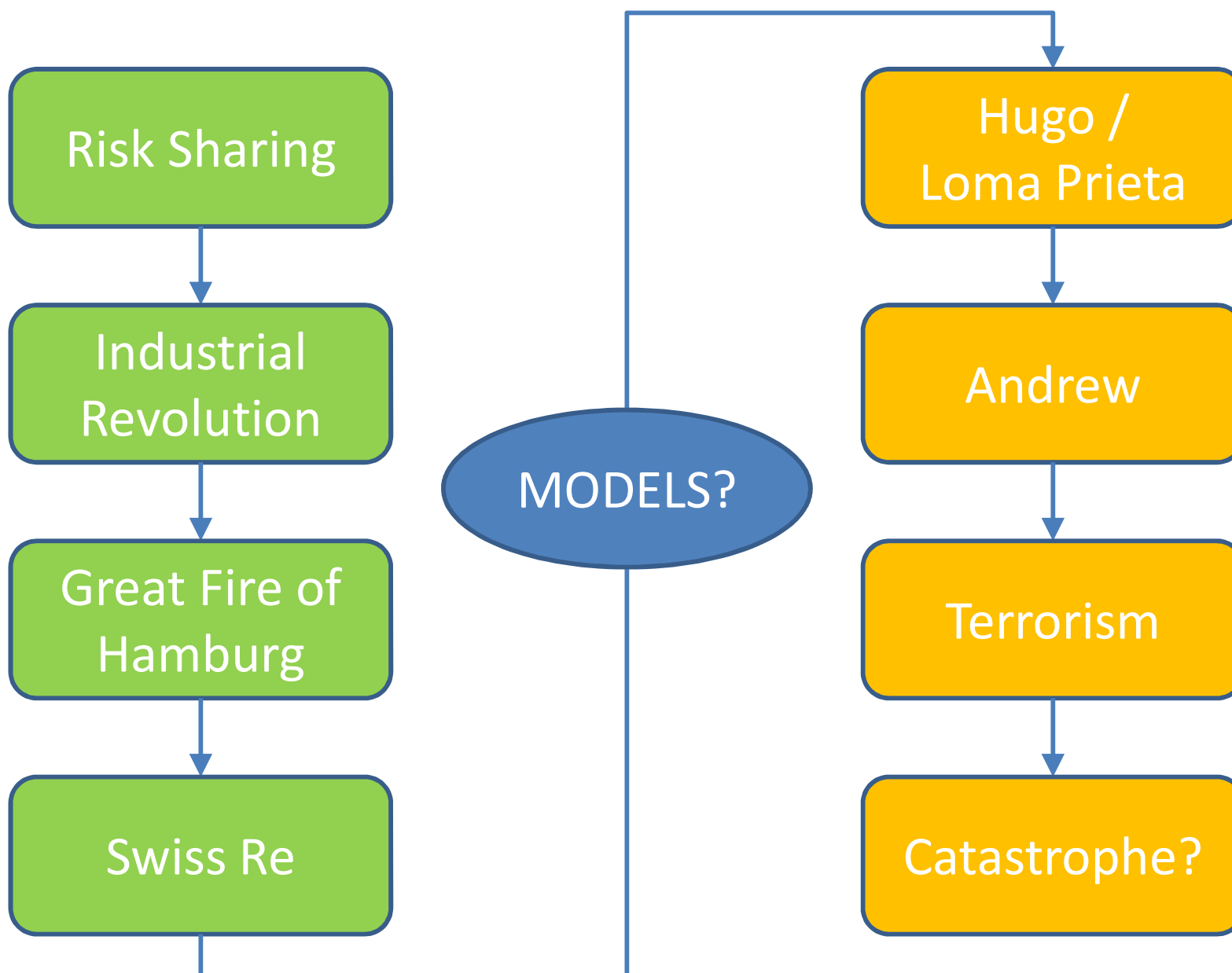
Risk



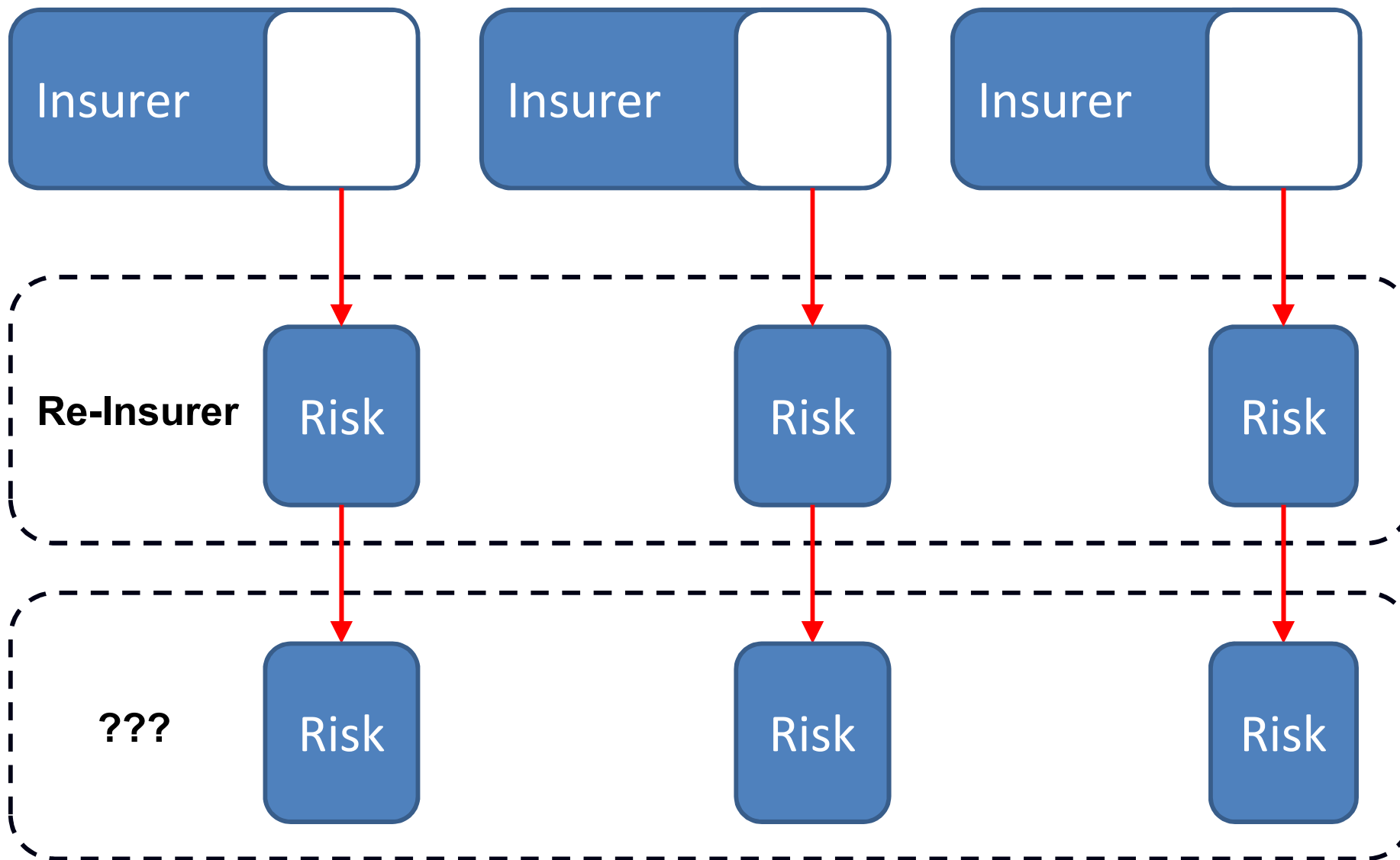
Evolution - Insurance



Evolution - Reinsurance

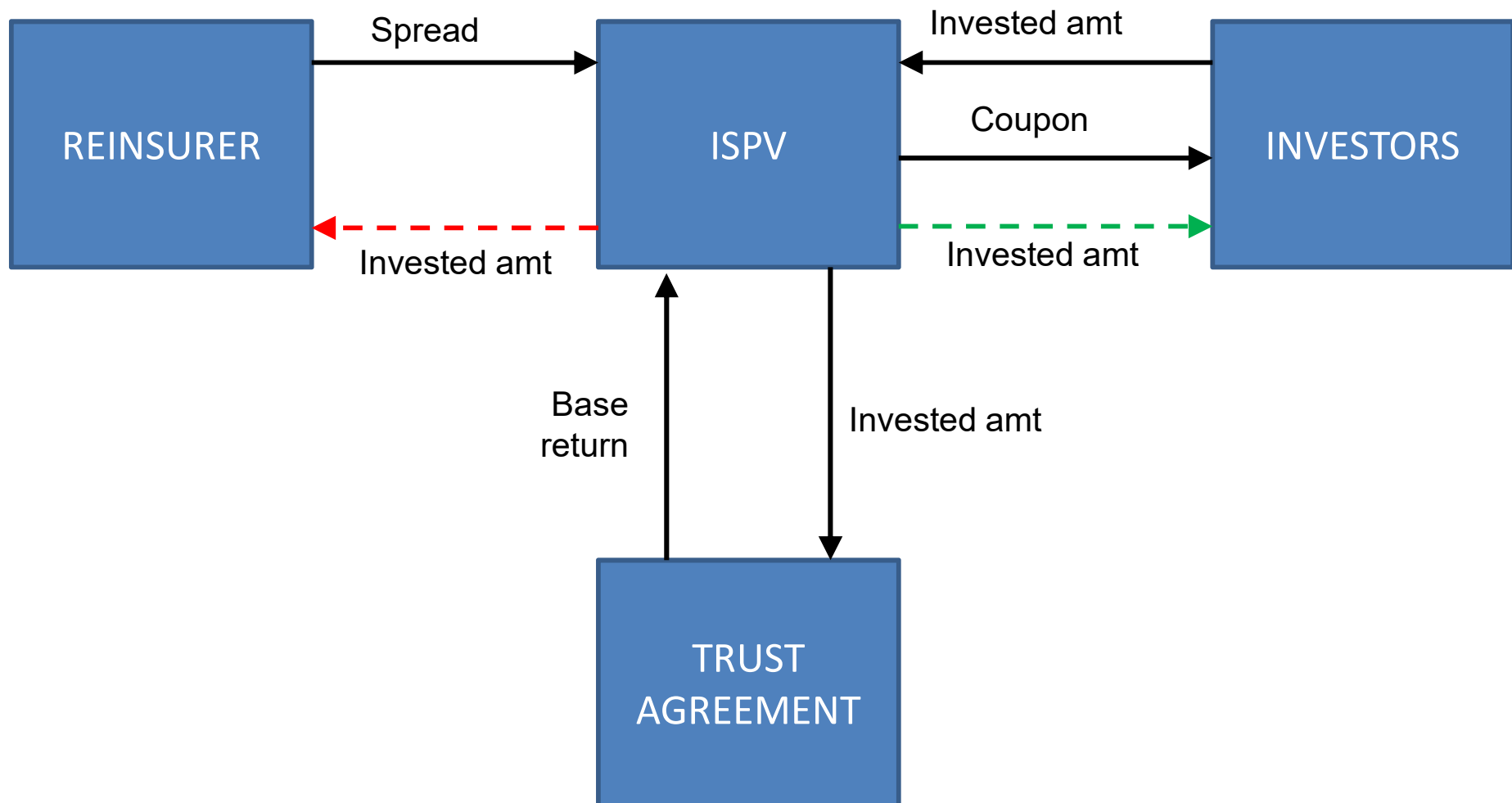


Passing On the Risk



Insurance-Linked Securities

- ◆ Transfer of insurance risk to the capital markets.
- ◆ Usually linked to natural disasters.

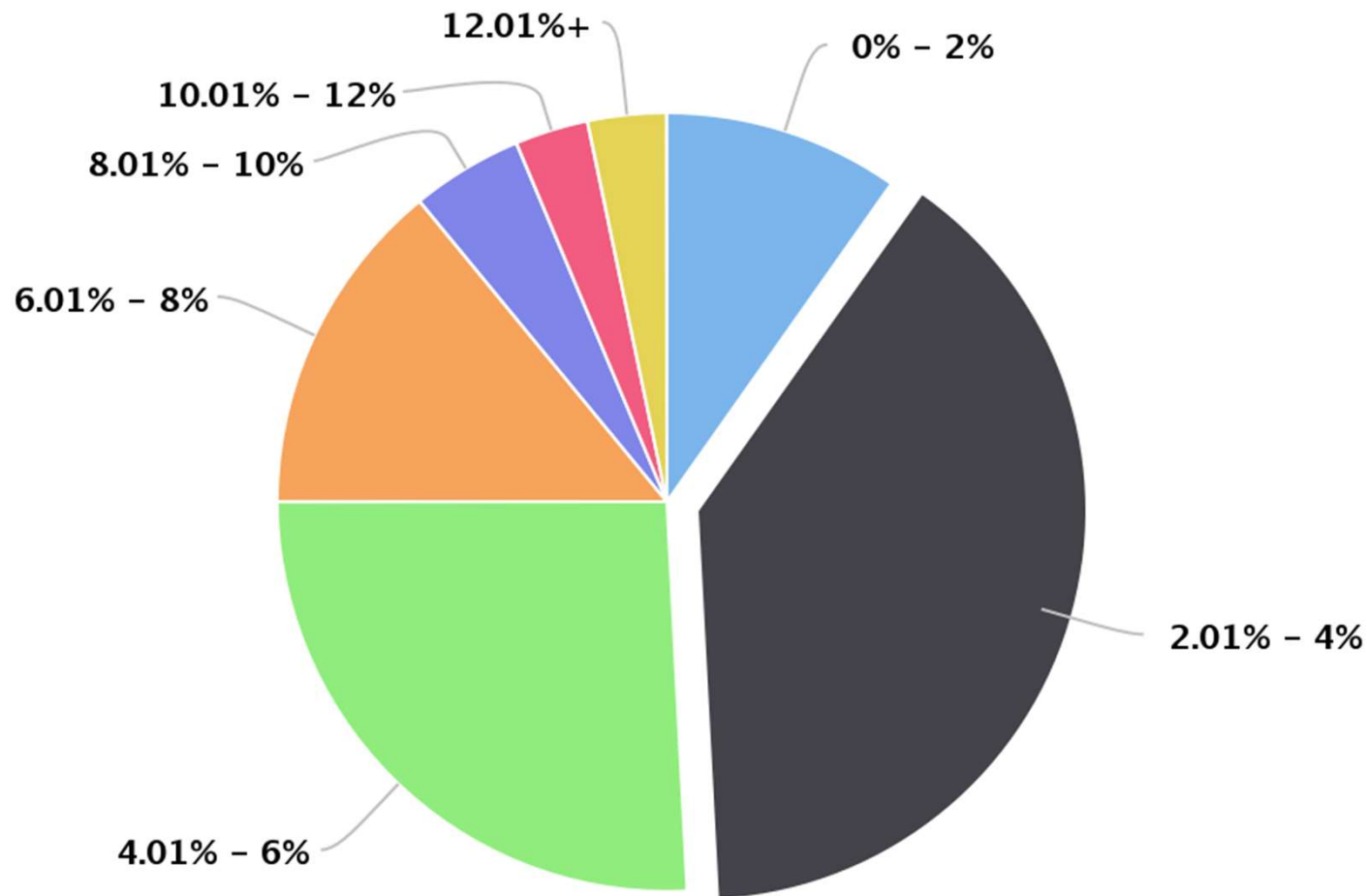


Insurance-Linked Securities

- ◆ Total size of ILS market (tradable and OTC) is \$100 billion.
- ◆ From the end of the 1990s to 2005 the value of outstanding ILS's grew by an average of 25% annually.
- ◆ In the first half of 2017, there was \$8.4 billion of ILS issuance.
- ◆ Despite the major hurricanes of 2017 – Harvey, Irma & Maria – which made it one of the worst years on record for natural disasters – appetite for Cat Bonds remains strong.

Insurance-Linked Securities

Catastrophe bonds & ILS risk capital outstanding by coupon pricing



Insurance-Linked Securities

- ◆ Triggering and Parametrisation
- ◆ Non-Natural-Catastrophe ILS's
- ◆ Pandemic Emergency Financing
- ◆ Pool Re's Terror-Linked ILS

Cyber Risk

Theft

- ◆ Data
- ◆ Cash
- ◆ Credentials

Damage

- ◆ Long term data corruption
- ◆ Algorithmic systems failures
- ◆ Leaks, abuse of data, defamation
- ◆ Data centres, internal and cloud servers

Disruption

- ◆ Power grid
- ◆ GPS
- ◆ Transport systems
- ◆ Communications
- ◆ Degrading or denial of service
- ◆ Tactical data espionage

Cyber Coverage

Cyber Coverage	% of Products Offering this Cover
Breach of privacy event	92%
Data and software loss	81%
Incident response costs	81%
Cyber extortion	73%
Business interruption	69%
Multi-media liabilities (defamation and disparagement)	65%
Regulatory and defence coverage	62%
Reputational damage	46%
Network service failure liabilities	42%
Contingent Business Interruption	33%
Liability – Technology Errors & Omissions	27%
Liability – Professional Services Errors & Omissions	23%
Financial theft & fraud	23%
Intellectual property (IP) theft	23%
Physical asset damage	19%
Death and bodily injury	15%
Cyber terrorism	12%
Liability – Directors & Officers	13%
Liability – Product and Operations	8%
Environmental damage	4%

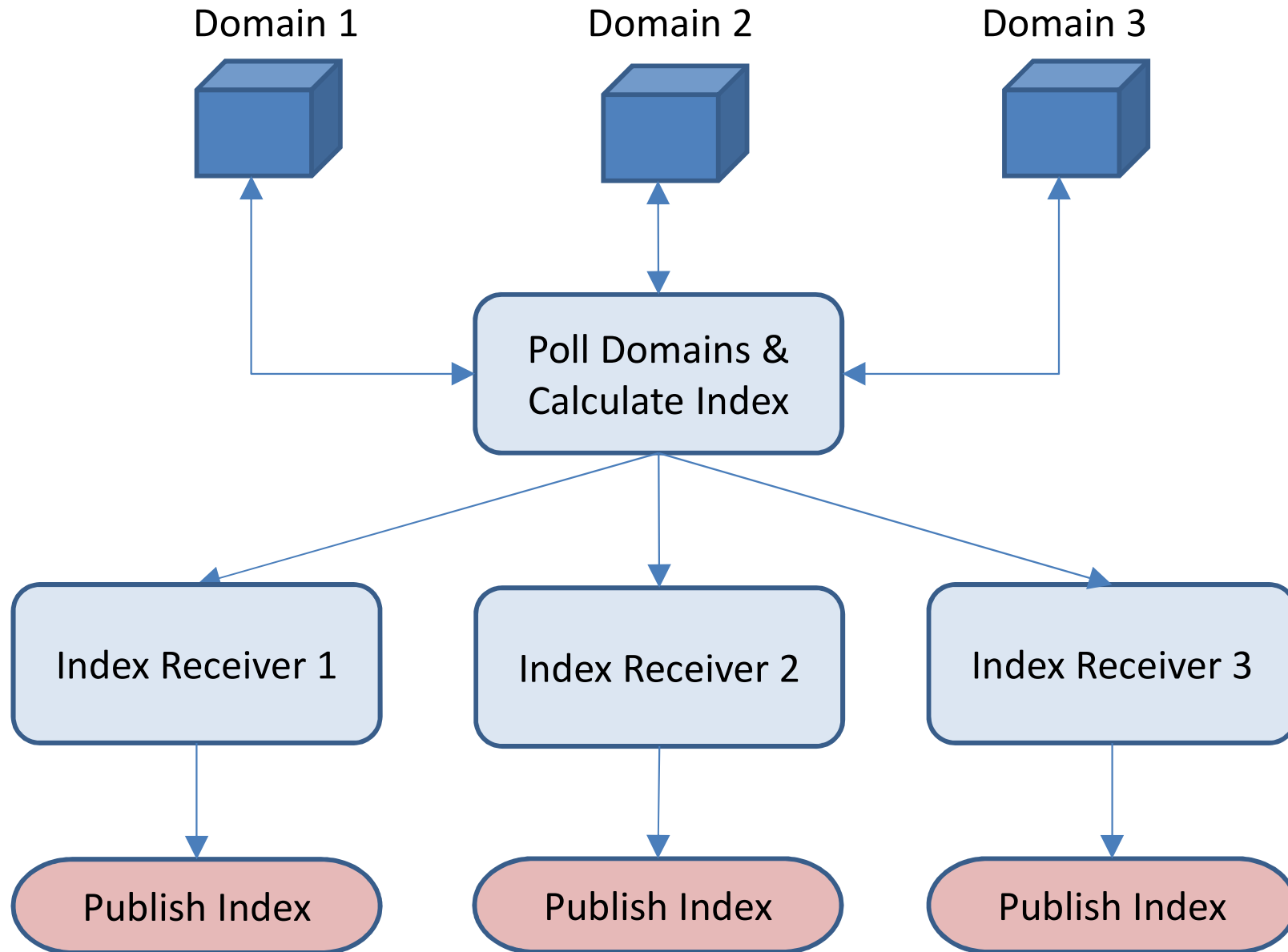
Business Interruption

- ◆ DoS and DDoS
 - ◆ Great Cannon Of China

- ◆ Cloud Outage
 - ◆ AWS 2011 outage

- ◆ Hardware
 - ◆ Super Micro “spy chip”

A Technical Solution



Smart Ledgers

- ◆ The mechanism must be:
 - ◆ Public
 - ◆ Trustworthy
 - ◆ Robust

- ◆ Smart Ledgers:
 - ◆ Have a super audit trail
 - ◆ Are unalterable
 - ◆ Use a distributed architecture

Demonstration

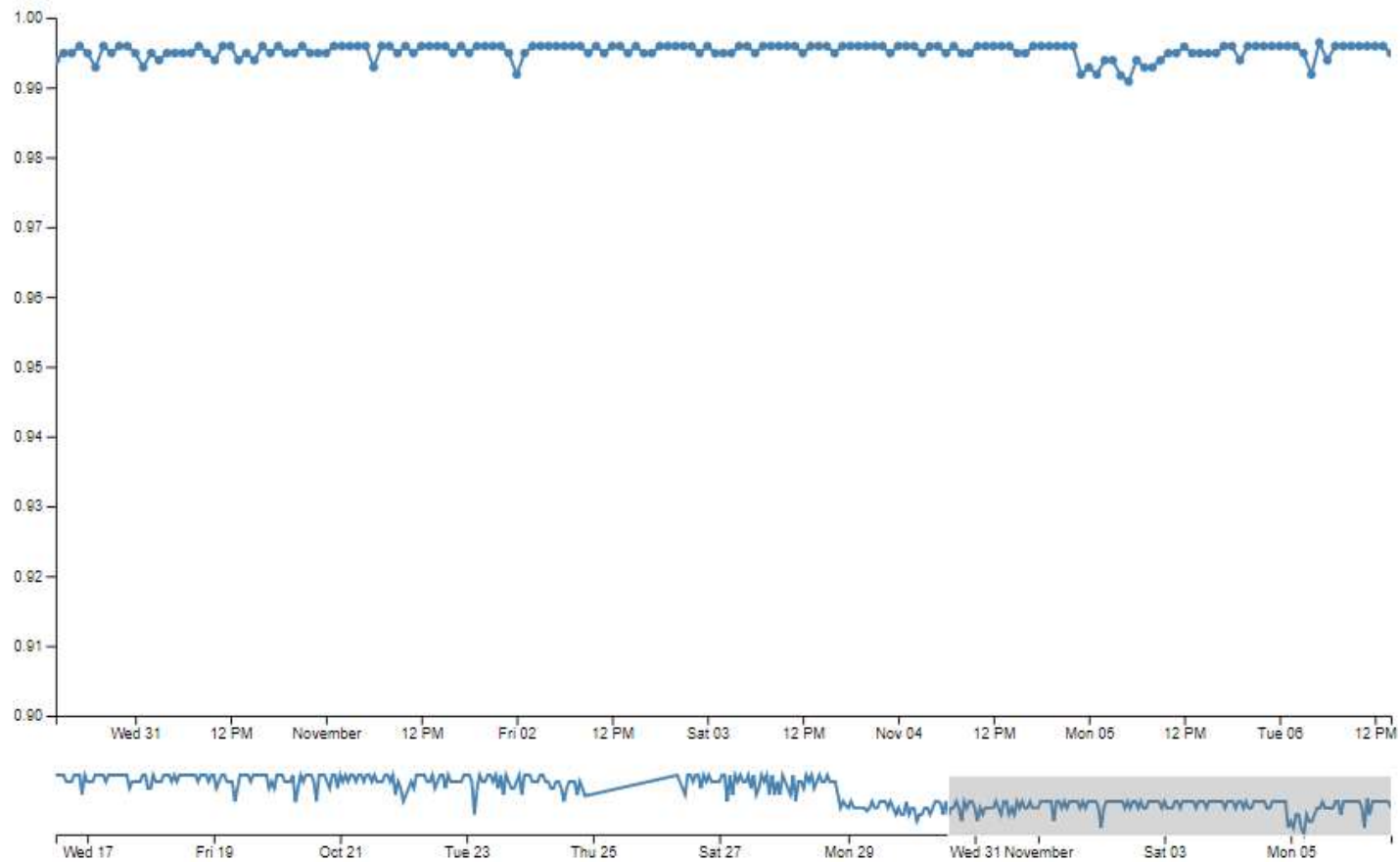
The Index



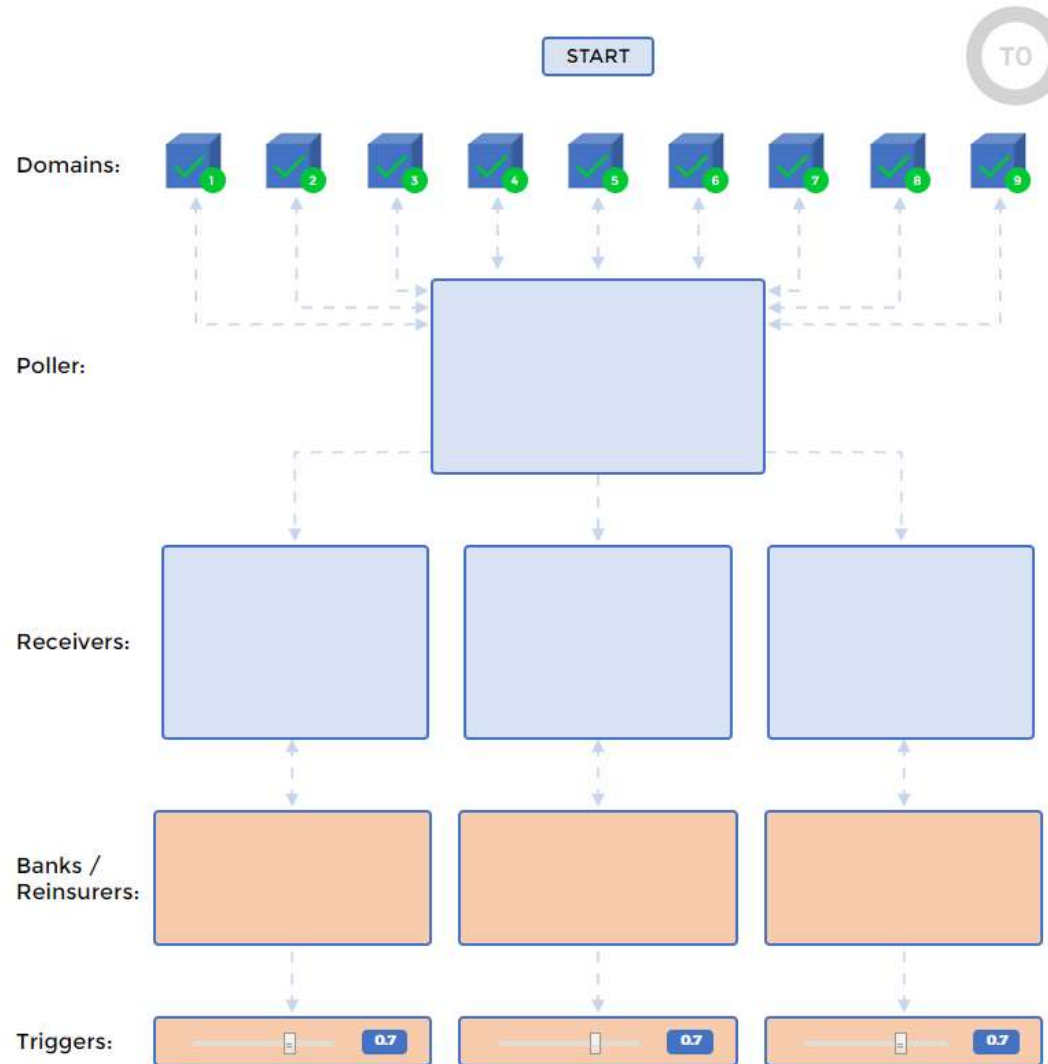
Cyber Catastrophe Insurance Linked Securities - Pilot

Architecture Demo

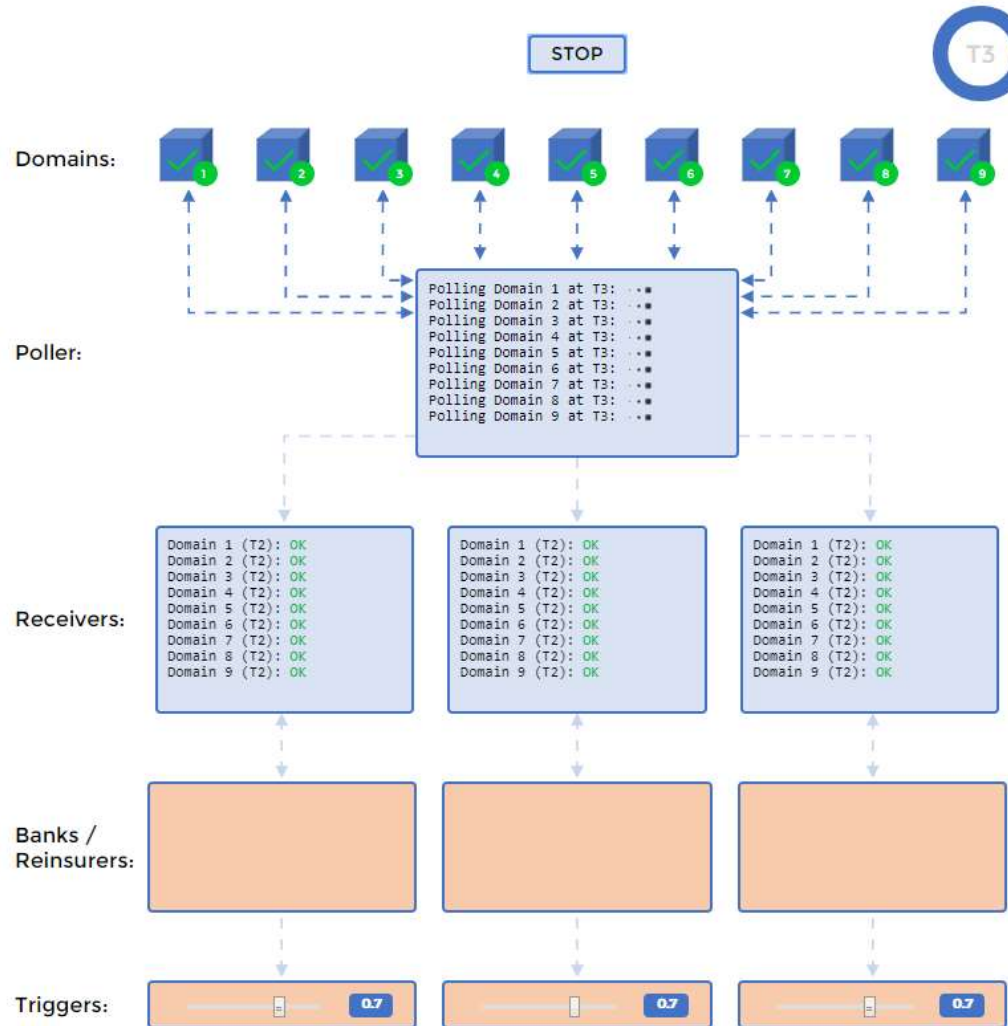
Live Index



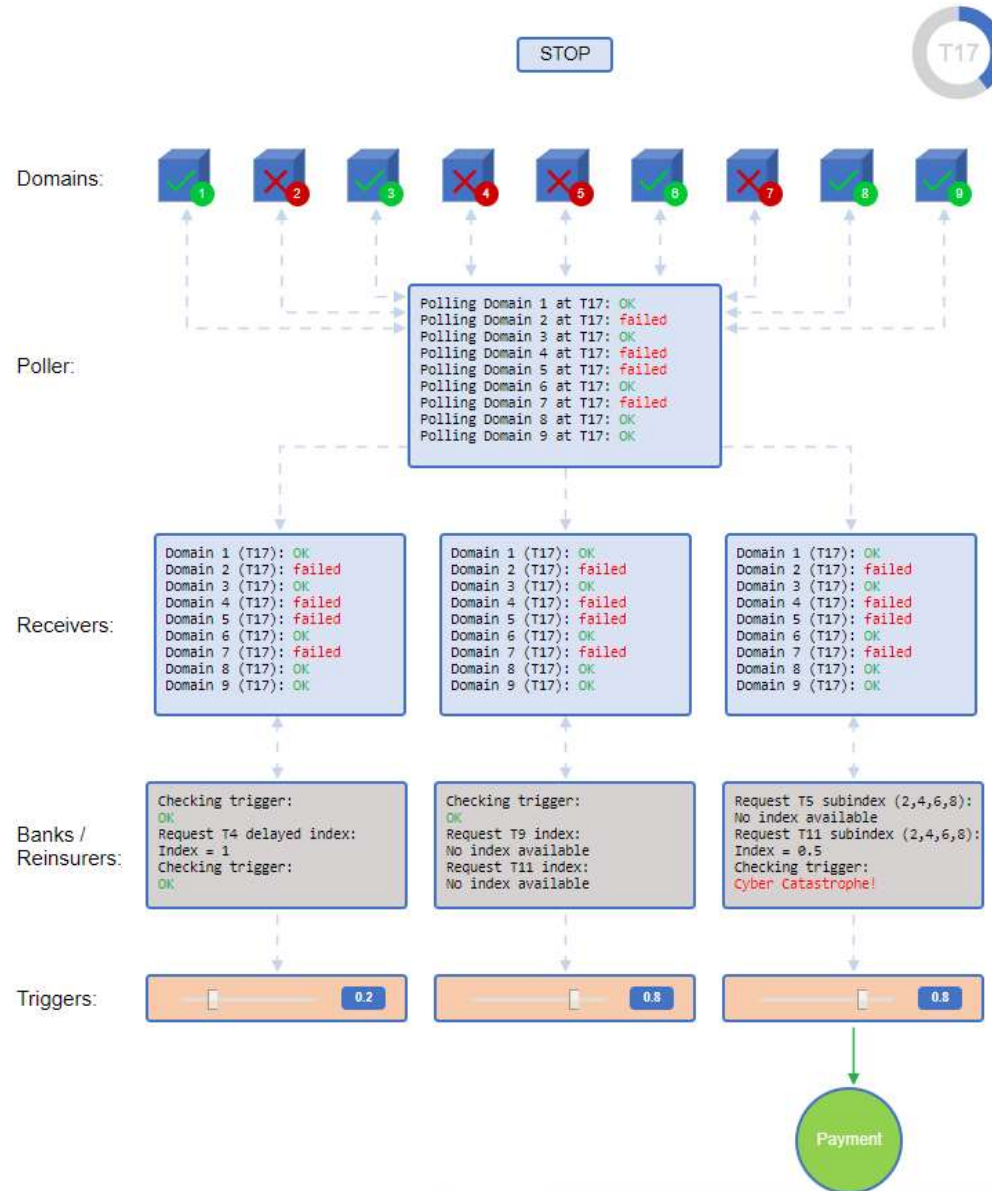
Architecture



Polling



Trigger



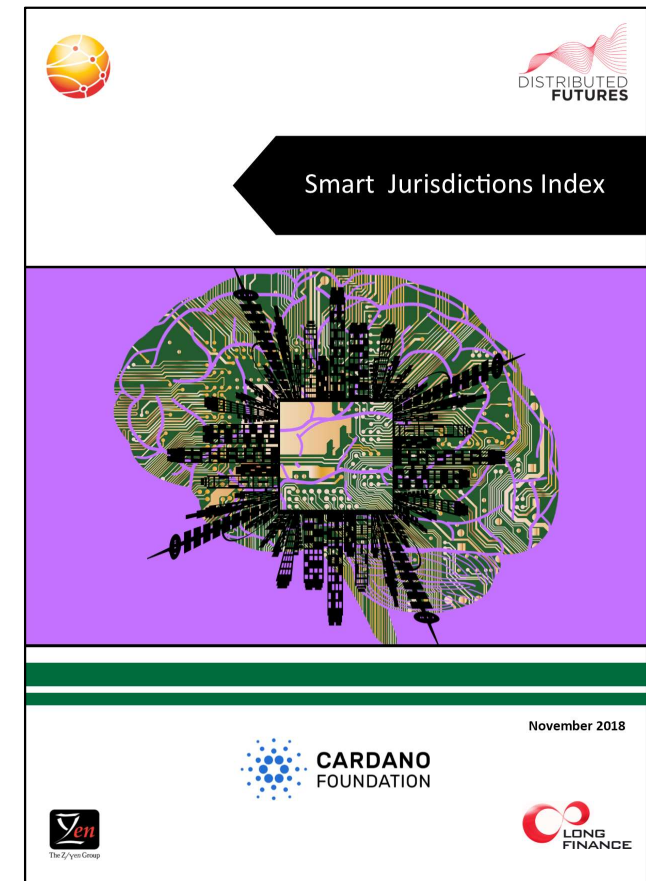
Smart Jurisdictions Index



Mike Wardle
*Financial Centre Futures
Programme*



Greg Williams
Z/Yen Group



Why A Smart Jurisdictions Index?

- ◆ Emerging Markets
- ◆ New Approaches To Regulation
- ◆ Varying Appetites Amongst Jurisdictions
- ◆ Speed Of Development



Who Is The Index For?

◆ Now: 

➤ Regulators

➤ Investors

◆ Going Forward: 

➤ Governments

➤ Central Banks

➤ Finance Ministries

➤ Service Providers

➤ Entrepreneurs & Investors

How Will It Work?

- ◆ 48 Jurisdictions
- ◆ 104 Base Level Instrumental Factors

Business Environment

Reputational

Infrastructure

Financial Service

Human Capital

- ◆ Plus...Smart Ledger Technology Instrumental Factors

Legal

Documentation

Identity

Payments

The Results



Jurisdiction	Overall Rank	Overall Score
USA - Delaware	1	57.13
USA - Indiana	1	57.13
USA - Iowa	1	57.13
USA - Nevada	1	57.13
USA - New York	1	57.13
USA - Utah	1	57.13
USA - Wyoming	1	57.13
USA - Texas	8	56.52
USA - Connecticut	9	55.63
France	10	55.12
Canada	11	54.82
Netherlands	12	54.73
UK - England	13	54.64
UK - Scotland	13	54.64
USA - Arizona	15	54.36
Germany	16	53.48
Sweden	17	52.42
Switzerland - Zug	18	51.47
Denmark	19	49.72
Australia	20	49.04
Finland	21	47.03
Singapore	22	46.97
Japan	23	46.54
China - Hong Kong	24	46.18

Jurisdiction	Overall Rank	Overall Score
Estonia	25	46.02
Ireland	26	45.04
Luxembourg	27	44.48
South Korea	28	42.32
China - not Hong Kong	29	41.46
Russian Federation	30	40.71
Israel	31	39.05
Brazil	32	38.54
Portugal	33	37.56
Malta	34	34.56
UAE	35	34.37
India	36	24.64
Indonesia	37	20.17
Kazakhstan	38	19.97
Liechtenstein	39	19.11
Isle of Man	40	17.46
Jersey	41	16.81
Alderney	42	15.90
Guernsey	43	12.98
San Marino	44	9.81
Gibraltar	45	9.48
Cayman Islands	46	8.87
Puerto Rico	47	8.28
Bermuda	48	7.82

The SJI World



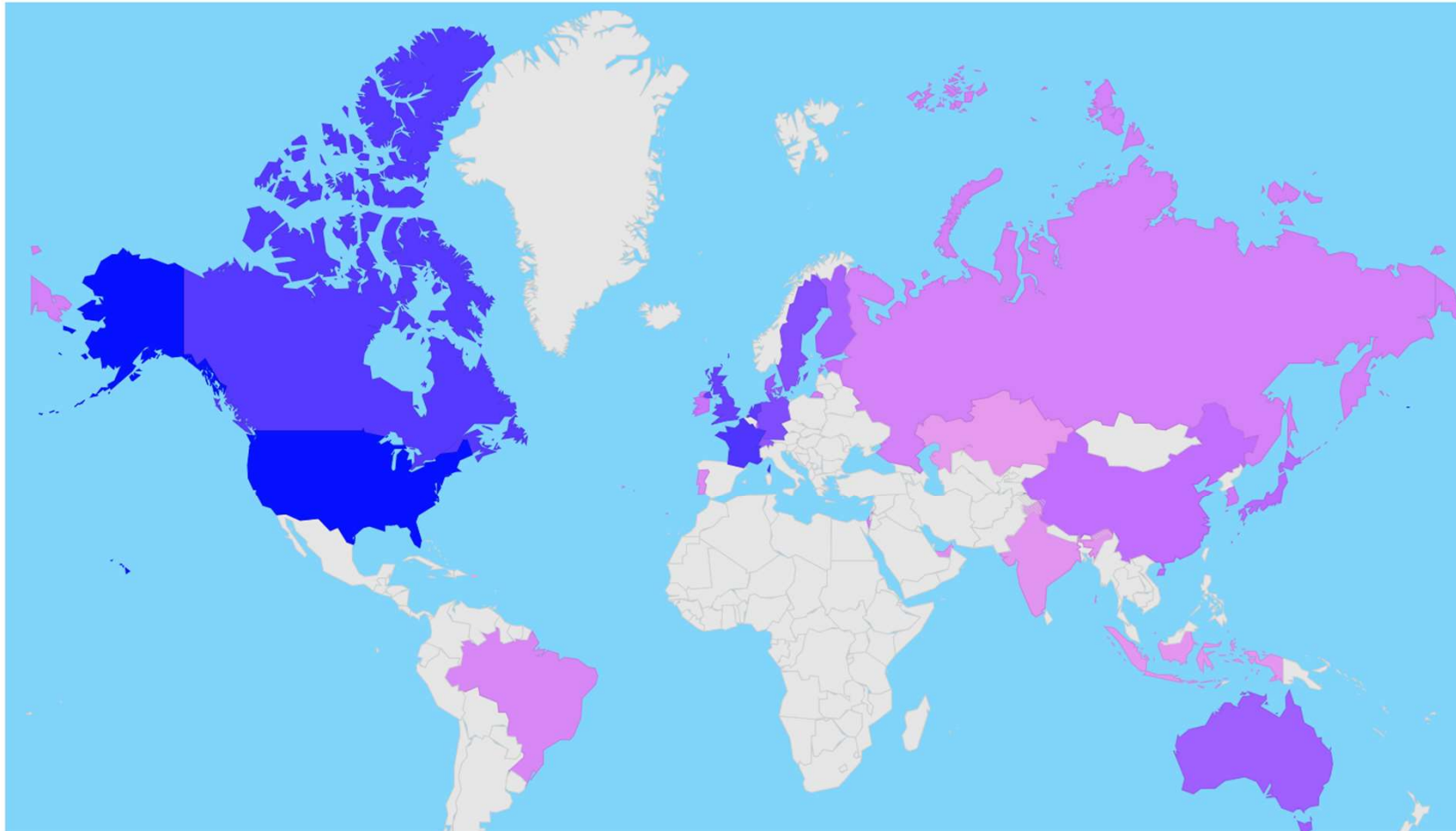
[About](#) [Index map](#) [Explore](#) [Report](#) [Feedback](#)

Select Jurisdiction for details:

Nothing Selected

Select region to view:

World



Focus On Asia



Smart
Jurisdictions
Index

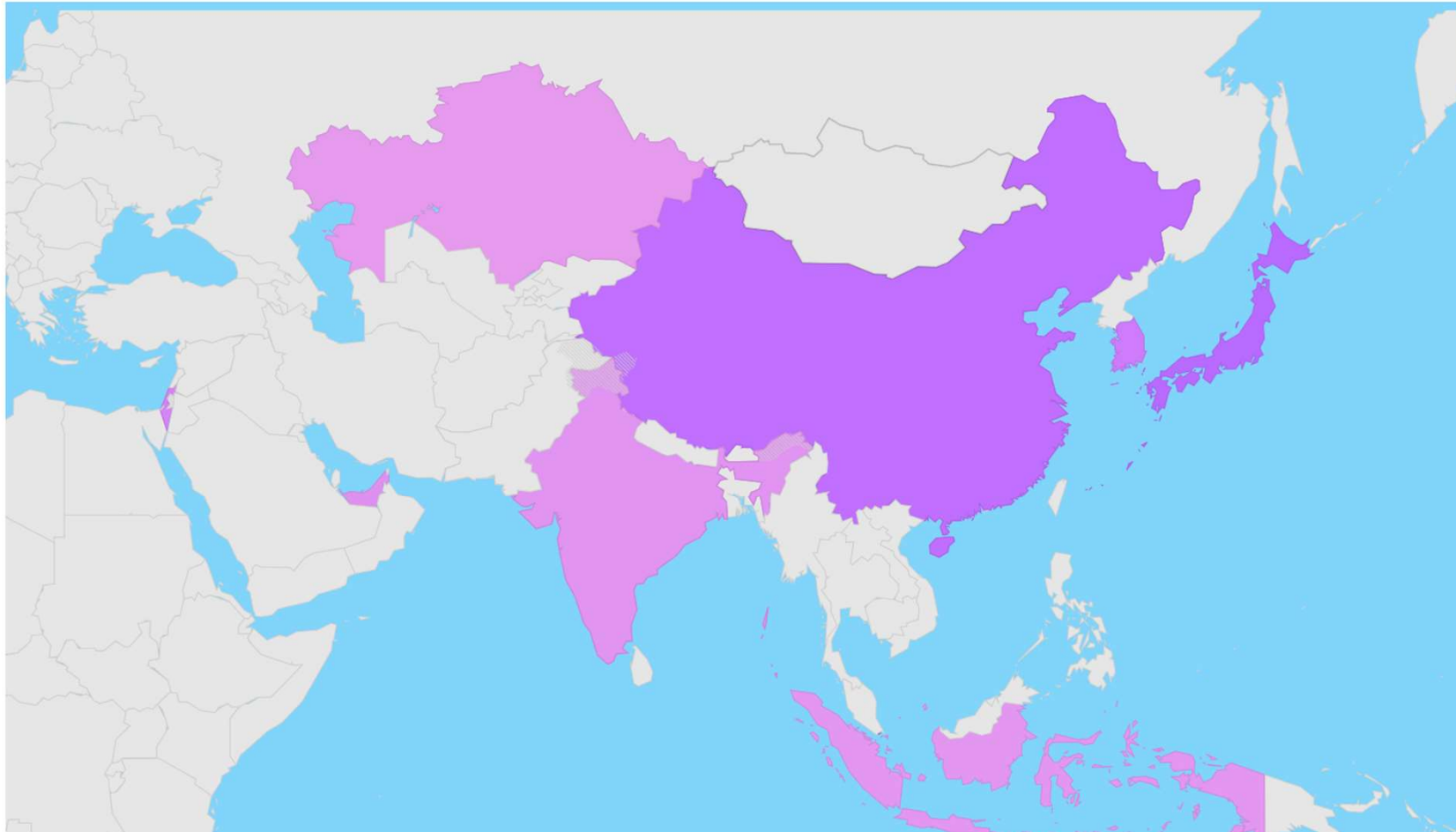
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Select Jurisdiction for details:

Nothing Selected

Select region to view:

Asia



Countries With Multiple Jurisdictions



Smart
Jurisdictions
Index

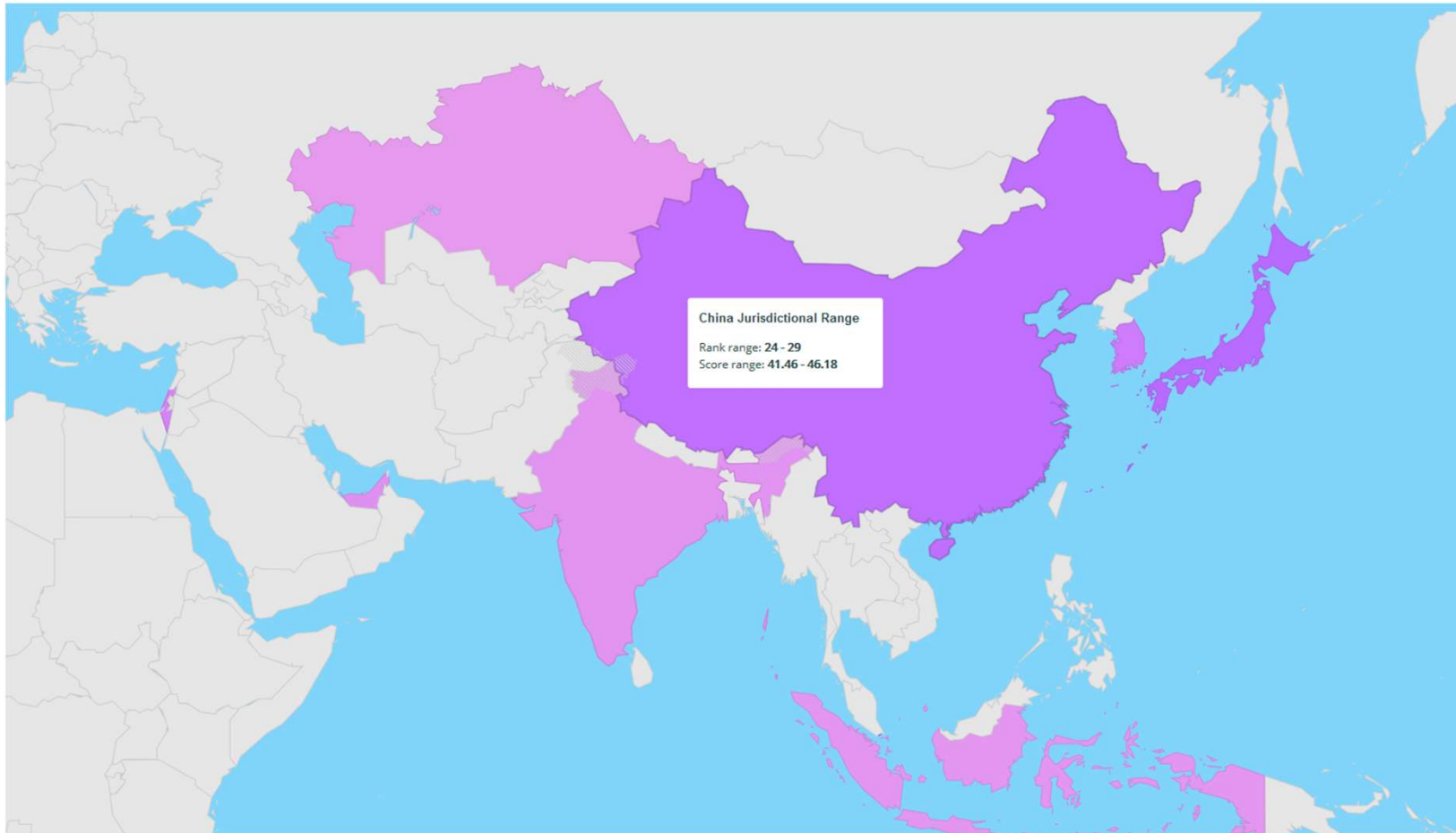
[About](#) [Index map](#) [Explore](#) [Report](#) [Feedback](#)

Select Jurisdiction for details:


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Select region to view:

Asia



Results & Notes - China

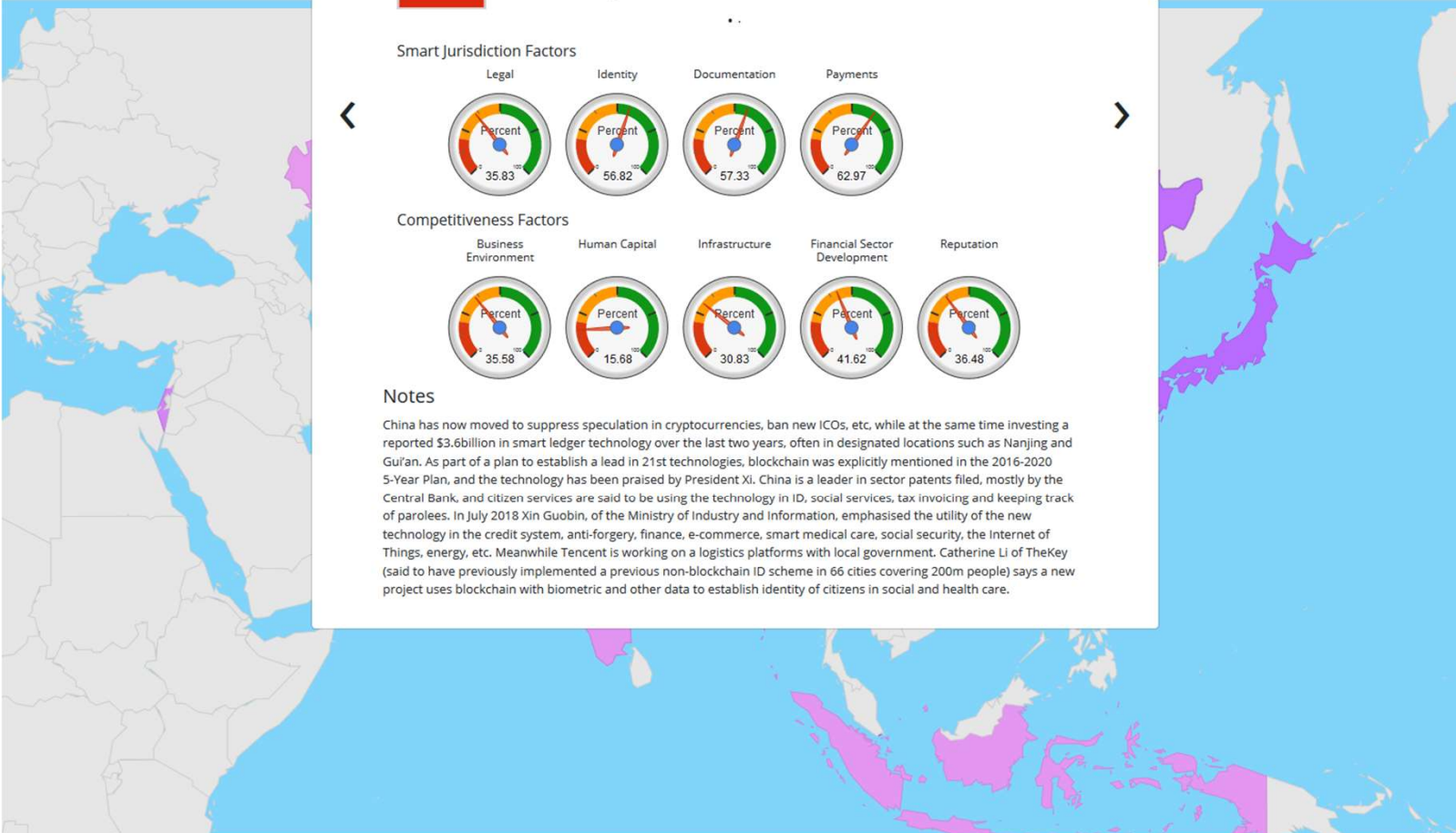



Smart Jurisdictions Index

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 [Report](#) |
 [Feedback](#)

Select Jurisdiction for details:

Nothing Selected






Region: **Asia/Pacific**

Overall Smart Jurisdiction Rank and Score: **29 / 41.46**

✕


Smart Jurisdiction Factors

Legal




35.83

Identity




56.82

Documentation



57.33


Payments



62.97

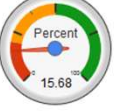
Competitiveness Factors

Business Environment




35.58

Human Capital




15.68

Infrastructure




30.83

Financial Sector Development



41.62

Reputation

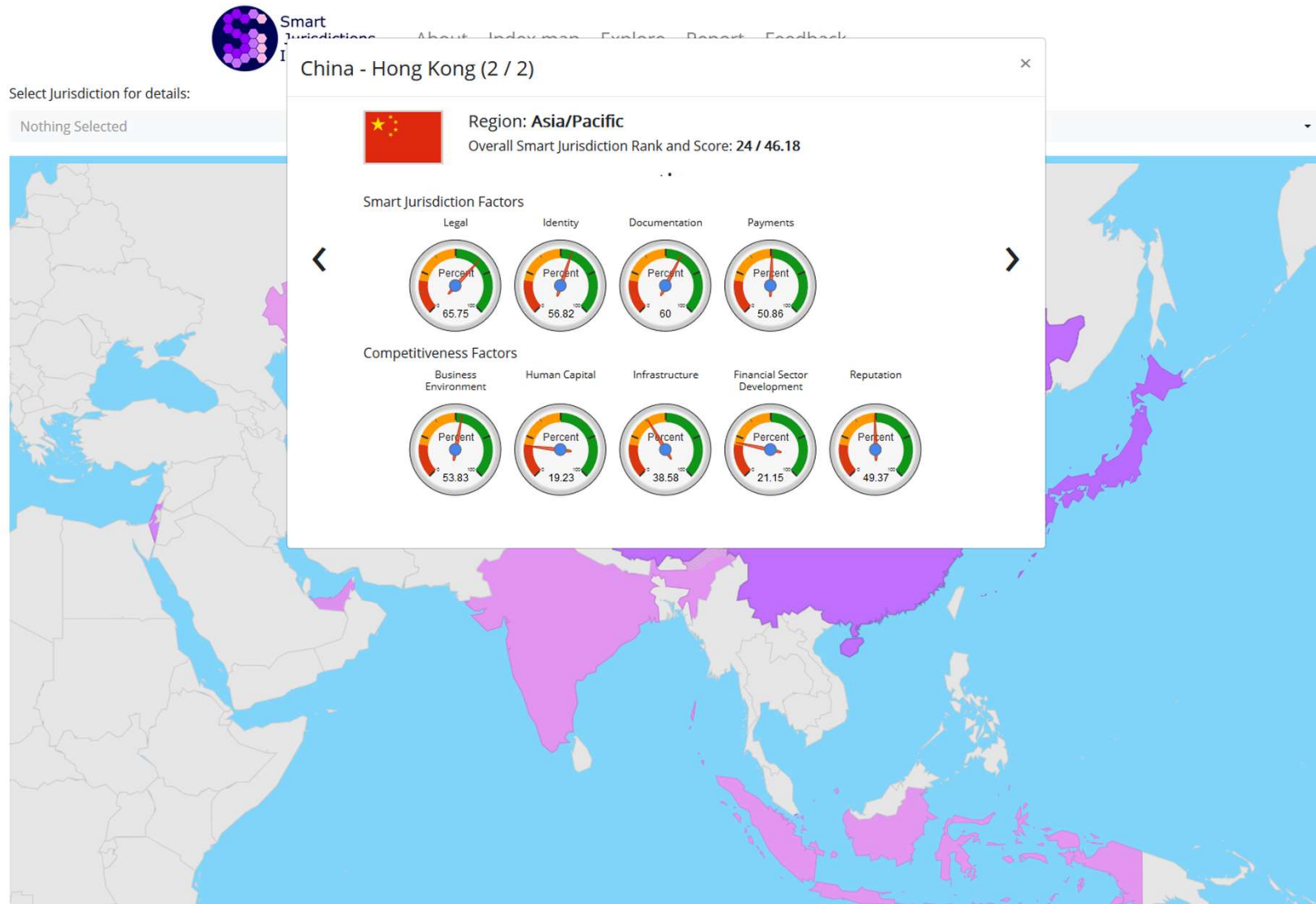


36.48

Notes

China has now moved to suppress speculation in cryptocurrencies, ban new ICOs, etc, while at the same time investing a reported \$3.6billion in smart ledger technology over the last two years, often in designated locations such as Nanjing and Gui'an. As part of a plan to establish a lead in 21st technologies, blockchain was explicitly mentioned in the 2016-2020 5-Year Plan, and the technology has been praised by President Xi. China is a leader in sector patents filed, mostly by the Central Bank, and citizen services are said to be using the technology in ID, social services, tax invoicing and keeping track of parolees. In July 2018 Xin Guobin, of the Ministry of Industry and Information, emphasised the utility of the new technology in the credit system, anti-forgery, finance, e-commerce, smart medical care, social security, the Internet of Things, energy, etc. Meanwhile Tencent is working on a logistics platforms with local government. Catherine Li of TheKey (said to have previously implemented a previous non-blockchain ID scheme in 66 cities covering 200m people) says a new project uses blockchain with biometric and other data to establish identity of citizens in social and health care.

Results - Hong Kong



Developing The Index

- ◆ Instrumental Factors A Good Starting Point
- ◆ Intention To Develop A Companion Survey
- ◆ Gather Views On Jurisdictions' Performance On
 - Identity
 - Legal
 - Documentation
 - Payments
- ◆ Allows The Development Of A More Comprehensive View Of The Smart Jurisdictions World

Next Steps

- ◆ Gather Feedback On What We Have Done So Far
 - Please Fill In Our Questionnaire!
- ◆ Use Feedback To Develop the Smart Jurisdictions Index
- ◆ Develop Survey
- ◆ Check Future Results Against Reality

Information Rules: Smart Ledgers & Permissions



Maury Shenk
*Maury Shenk, Managing
Director, Lily Innovation*

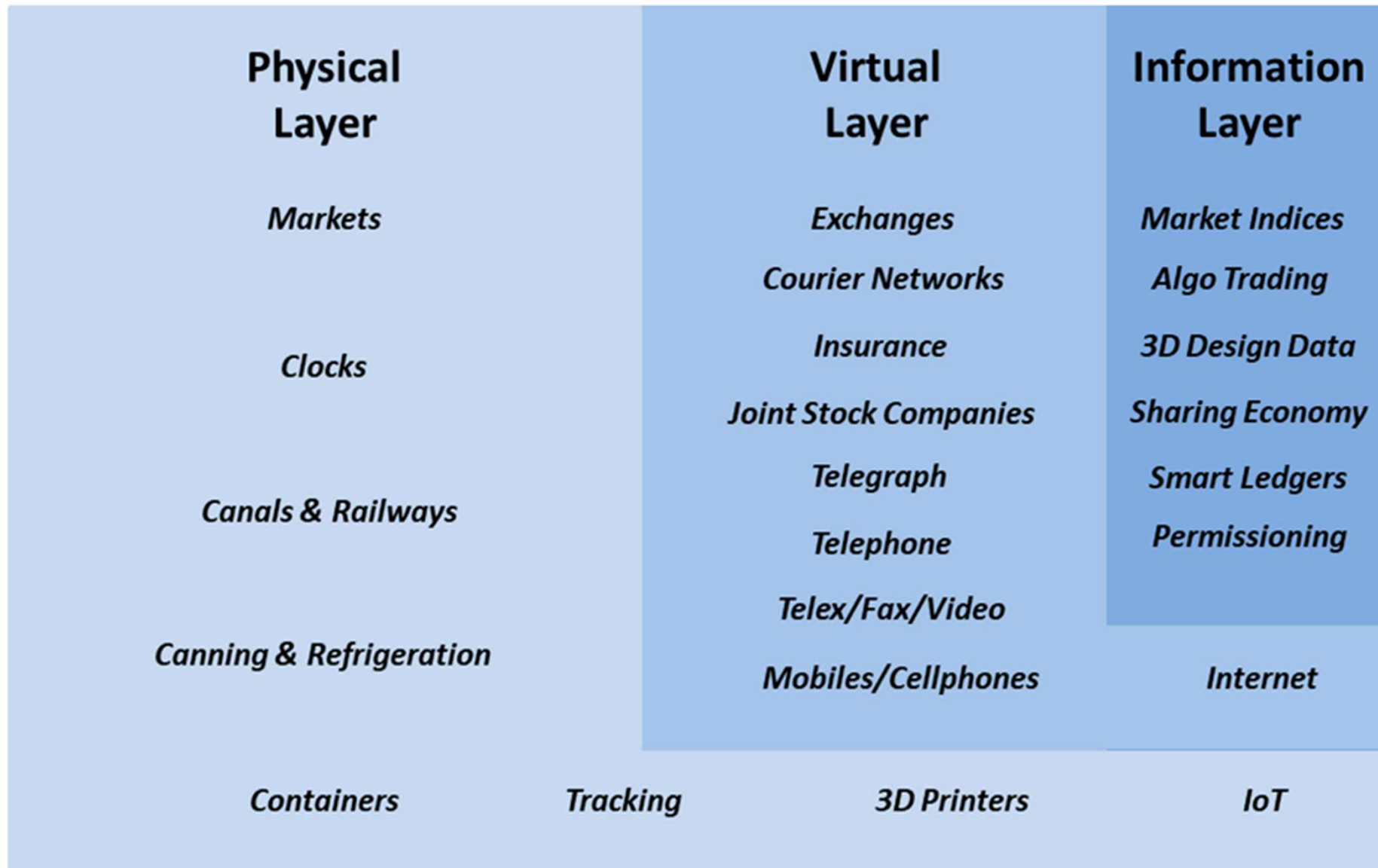


Why We Need a Permissions Framework

- ◆ Permission (or not) to use digital / online resources is at the core of our information economy
- ◆ But there are major holes in existing frameworks
 - No widely-accepted standards
 - Major cybersecurity issues as more devices come online (e.g. IoT)
 - Difficulty of implementing concepts of “may” and “should” (or not) on Boolean devices
- ◆ Need to move beyond access control



Three Market Layers



Examples of Market Layers

- ◆ **Physical layer:** actual exchange



- ◆ **Virtual layer:** communications about exchange



- ◆ **Information layer:** metadata about exchange

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Choosing a Permissions Framework

- ◆ Criteria
 - Precision – ability to accurately convey permissions
 - Breadth – ability to convey any permission
 - Applicability – comprehensibility and practicality for real-world markets
- ◆ Candidates
 - Access control
 - Standard for computer systems
 - Comes in many flavors – e.g. access control list, role-based, attribute-based
 - Differential privacy – conveying information while avoiding disclosure of personal information
 - Deontic logic – formal logic of “may” and “ought”

Deontic Logic in Practice (for Identity)

What a Human Hears	High-Level Proposition	Propositional Variables	Deontic Proposition
You are an authorised user of this computer system	Person X may access resource R	$AR_x = X$ accesses resource R	$P(AR_x)$
If you are in the finance department, you may access the accounting system	If person X belongs to group G, she may access resource R	$AR_x = X$ accesses resource R $G = \text{group } G$	$\text{If } X \in G \rightarrow P(AR_x)$
Would Mr. Jones please go to the ticketing desk	If recipient of message is person X, she should take action A	$U = \text{recipient of message}$ $A_x = X$ takes action A	$\text{If } U = X \rightarrow O(A_U)$ $\text{If } U = X \rightarrow O(A_X)$
Sorry, no admittance for under 18s	If person X is under age K, she may not access resource R	$K_x = \text{age of } X$ $AR_x = X$ accesses resource R	$\text{If } K_x < 18$ $\rightarrow \neg P(AR_x)$
No ID, no entry	If person X cannot prove she is over age K, she may not access resource R	$K_x = \text{age of } X$ $ID_x = \text{identification documents in } X\text{'s possession}$ $AR_x = X$ accesses resource R	$\text{If } (K_x > 18) \neg \vdash ID_x$ $\rightarrow \neg P(AR_x)$



Structure of a New Permission Architecture

Logical Access Control	Physical Access Control	Privacy	Consumer Financial	Securities Trading	Travel	Government Services	E-commerce
Domain-Specific Permission Libraries							
Deontic Logic API							
Deontic Logic Translation Engine							
Underlying Computing Operating System (<i>e.g.</i> , Linux, iOS, MacOS, Windows)							

Why and How Smart Ledgers?

- ◆ Advantages over centralised solutions
 - Inherently distributed
 - Open architectures are common / understood
- ◆ Technical challenges
 - Functions to manage technical complexity – requires an advanced, “third generation” architecture (e.g . Cardano)
 - Implementing deontic logic on a Boolean computer
- ◆ Legal challenges
 - Differ by jurisdiction (e.g. Europe, US, China, India)
 - Tensions between GDPR and Smart Ledgers (e.g. erasure, repeated processing) are surmountable



Panel Discussion & Questions

Panellists

Professor Michael Mainelli: *Executive Chairman, Z/Yen Group*

Ian Dowson: *Principal, William Garrity Associates*

Sam Carter: *Financial Services Researcher and Quant Developer*

Mike Wardle: *Financial Centres Future Programme*

Greg Williams: *Z/Yen Group*

Maury Shenk: *Managing Director, Lily Innovation*

Upcoming Research

- “Identity And Smart Ledgers (KYC/AML)”**
- “Online Simulation For Tokens And Currencies”**
- “Smart Ledger Surveillance Techniques”**
- “Green Ledgers, MDLs And Sustainability”**
- “Taxation And Smart Ledgers”**

When Would We Know Our Commerce Is Working?



“Get a big picture grip on the details.”
Chao Kli Ning

THE PRICE OF FISH

*A New Approach to Wicked Economics
and Better Decisions*



MICHAEL MAINELLI
AND IAN HARRIS

Thank you!