

# Forging Blockchains

## Spatial Production and Political Economy of Decentralized Cryptocurrency Code/Spaces

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# Rational for Study

- Literature of geographic studies of cryptocurrencies is non-existent
  - Increasingly dominant in spaces of everyday life
- Use of blockchain technologies in numerous political economies
  - Situated within traditional capitalist/neoliberal mindsets
  - Potential alternative economies
- Examination of code/space of Bitcoin/Ethereum
  - Code as matériel

# Literature Review

- Cyberspace
- Political Economy of Modes of Spatial Production
  - Henri Lefebvre - *The Production of Space*
  - Doreen Massey - *For Space*
  - David Harvey
    - Time/space compression
    - Dialectical Materialism
- Bitcoin
- Ethereum
- Code/space
  - Rob Kitchin & Martin Dodge - Code/space
  - Manuel Castells - Network Society

# Research Questions

- How do the systemic mechanisms and actant actions driving blockchain technologies indicate a new evolution in the conceptions of space and place in everyday life?
  - How are blockchain spaces produced?
  - How do blockchains relate to capital's processes and crises?
  - How are DAOs and blockchain frameworks situated within the theories of code/space and network society?

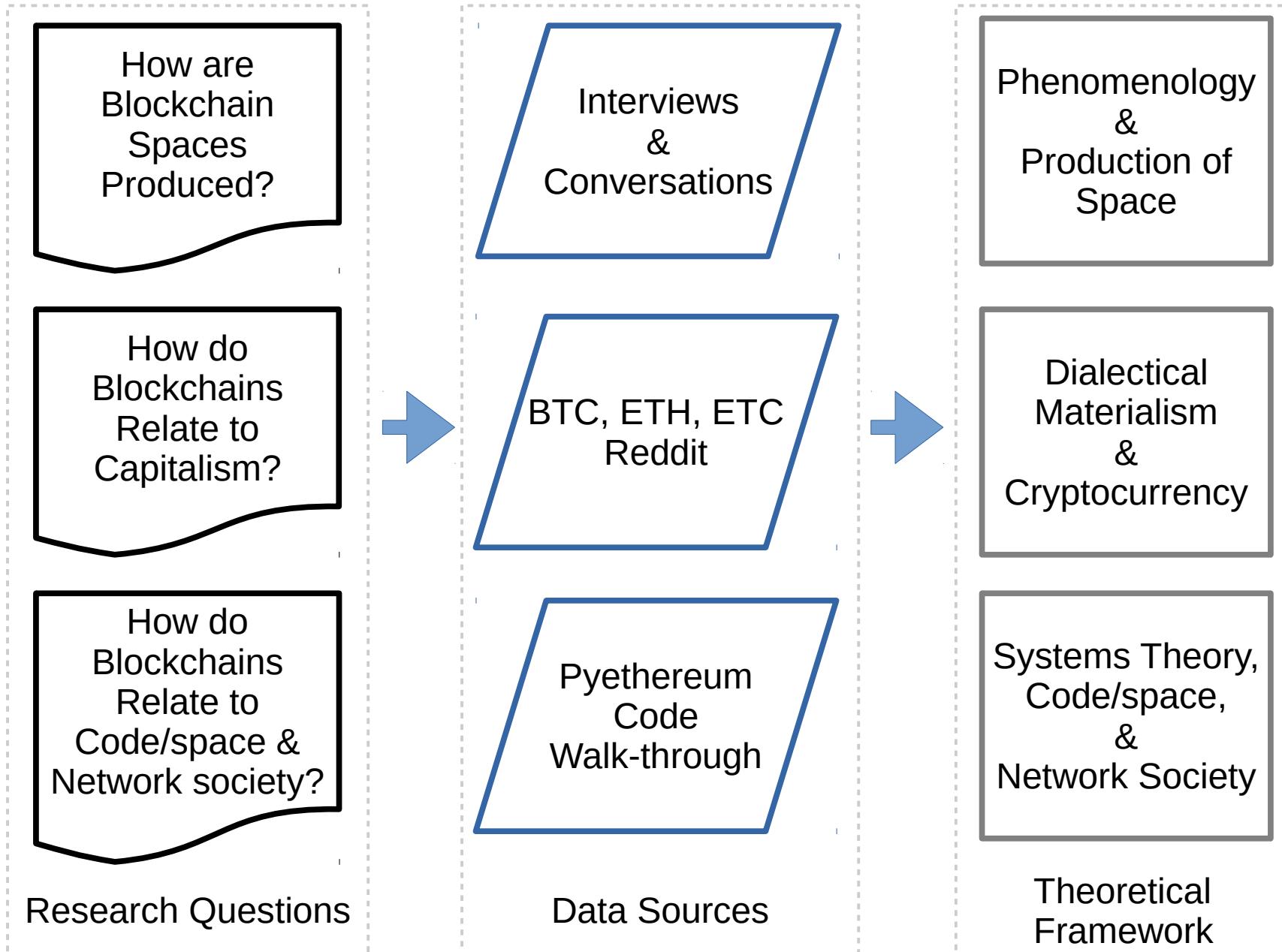
# Sources

- Open Conversations & Semi-structured Interviews
  - Developers, Investors, Users
  - History, Present, Future, Access, Ethics
- Documents, Grey Literature, and Other Sources
  - Reddit (top 1000 for BTC, ETH, ETC)
  - Pyethereum stack (software)
  - White Papers
  - News
  - Other media

# Theoretical Framework

- A phenomenological approach
  - Personal experiences and knowledge
  - Scales of community and social spaces
  - Perceptions and Positions
    - Human > system, System > human, Humans | systems | humans
- Dialectical Materialism
  - Capital conditions of cryptocurrencies, spatial fixes, crises
- Systems Theory
  - Code/space
    - Architectures, DAOs, components
  - Network society
    - Flows, borders, distances, limits to network analysis

# Methodology

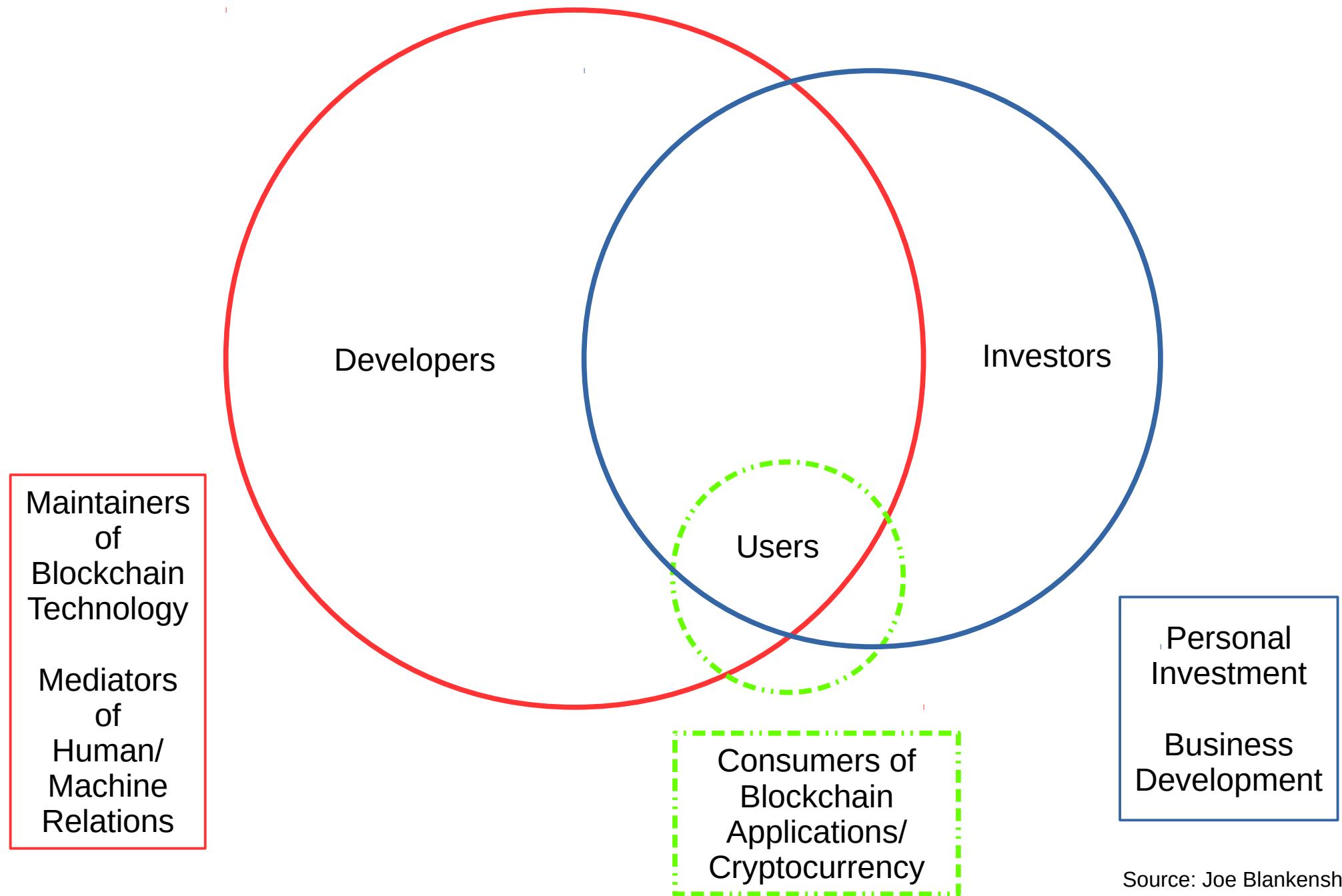


# Results

- Open Conversations and Semi-structured Interviews
  - History, Present, Future, Accessibility, Ethics
- Reddit Analysis
  - Bitcoin, Ethereum, Ethereum Classic (3000 total “top” records)
  - Authors, Comments, Data/time, Title content
- Code Walk-through
  - Ethereum User walk-through
  - Pyethereum Code walk-through

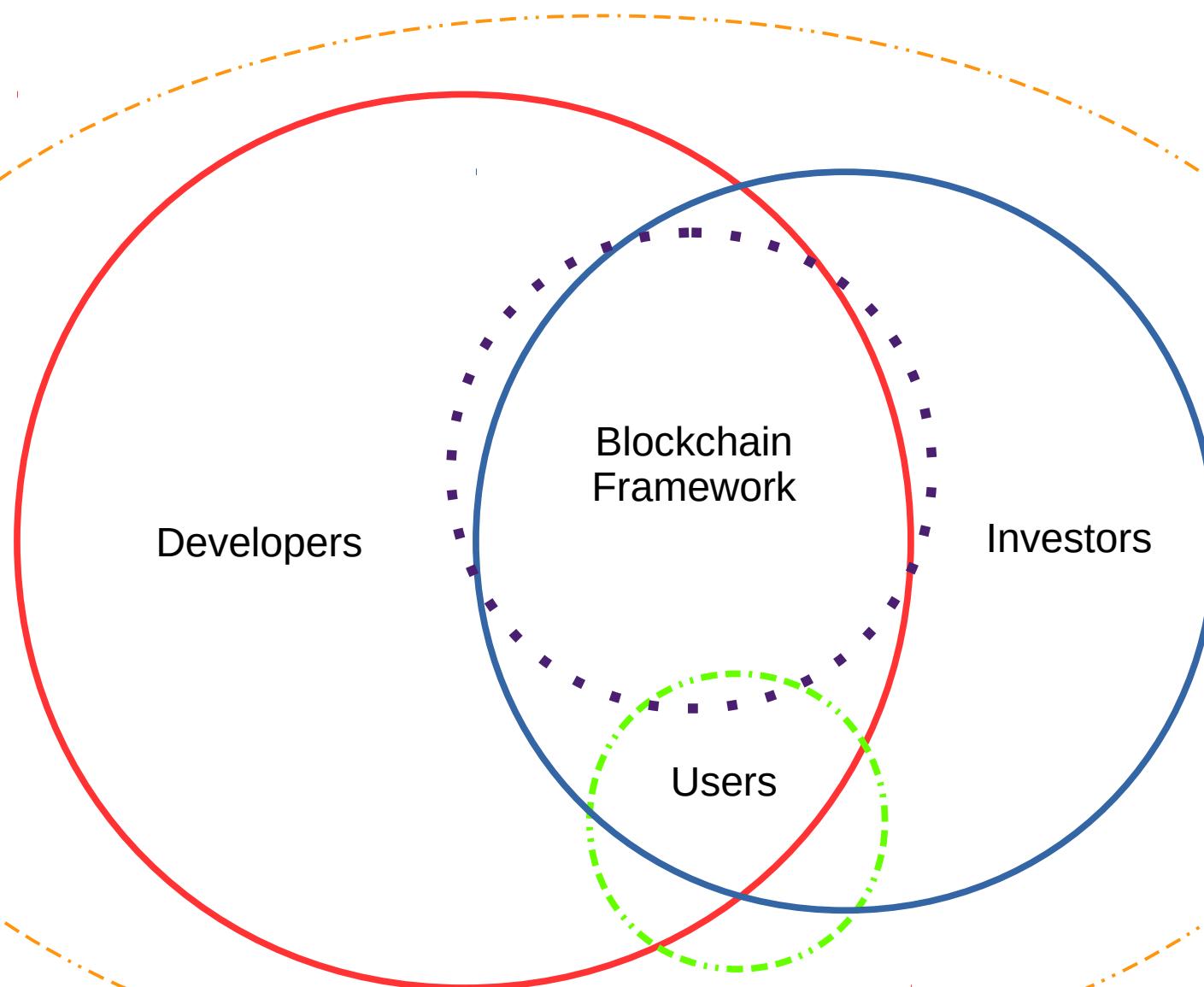
# Production of Space

# Social Spheres of Blockchain Spaces



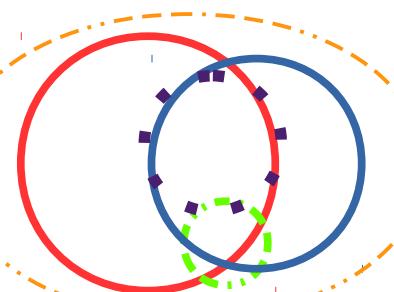
Source: Joe Blankenship

# Spatial Dynamics - Blockchain Frameworks

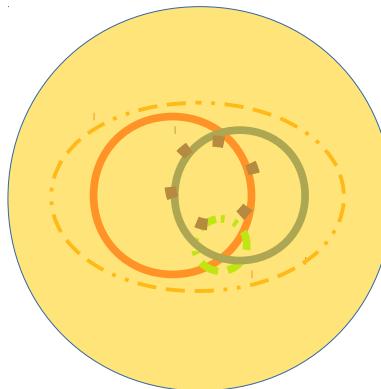


# Tokenization to Exchange

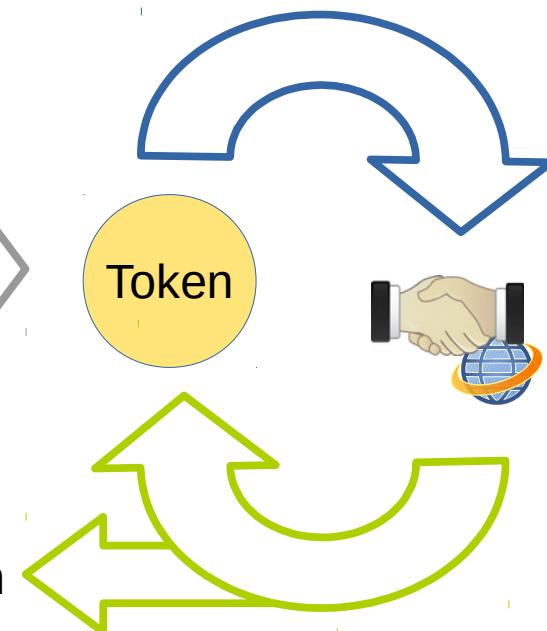
Social Space  
Dynamics  
Affect  
Means and Modes  
of Production



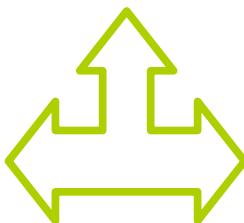
Process of  
Abstraction  
Produces Token



Token Value  
established through  
Exchange Processes



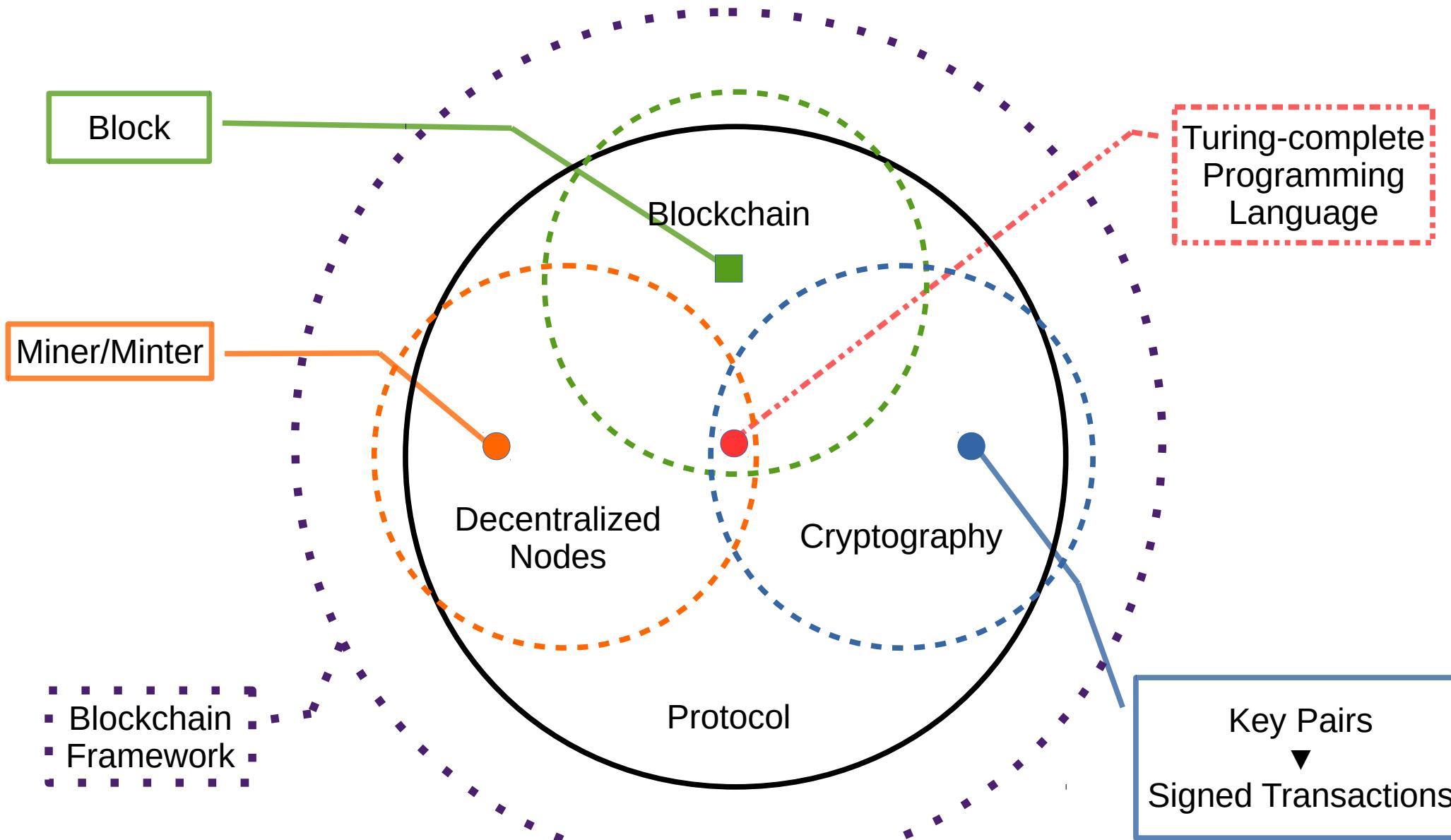
Transfer of  
Contradiction  
▼  
Processes of  
Reproduction  
▼  
Blockchain  
Ecosystem



Spaces of  
Contradiction  
between the  
Processes of  
Exchange and  
Tokenization

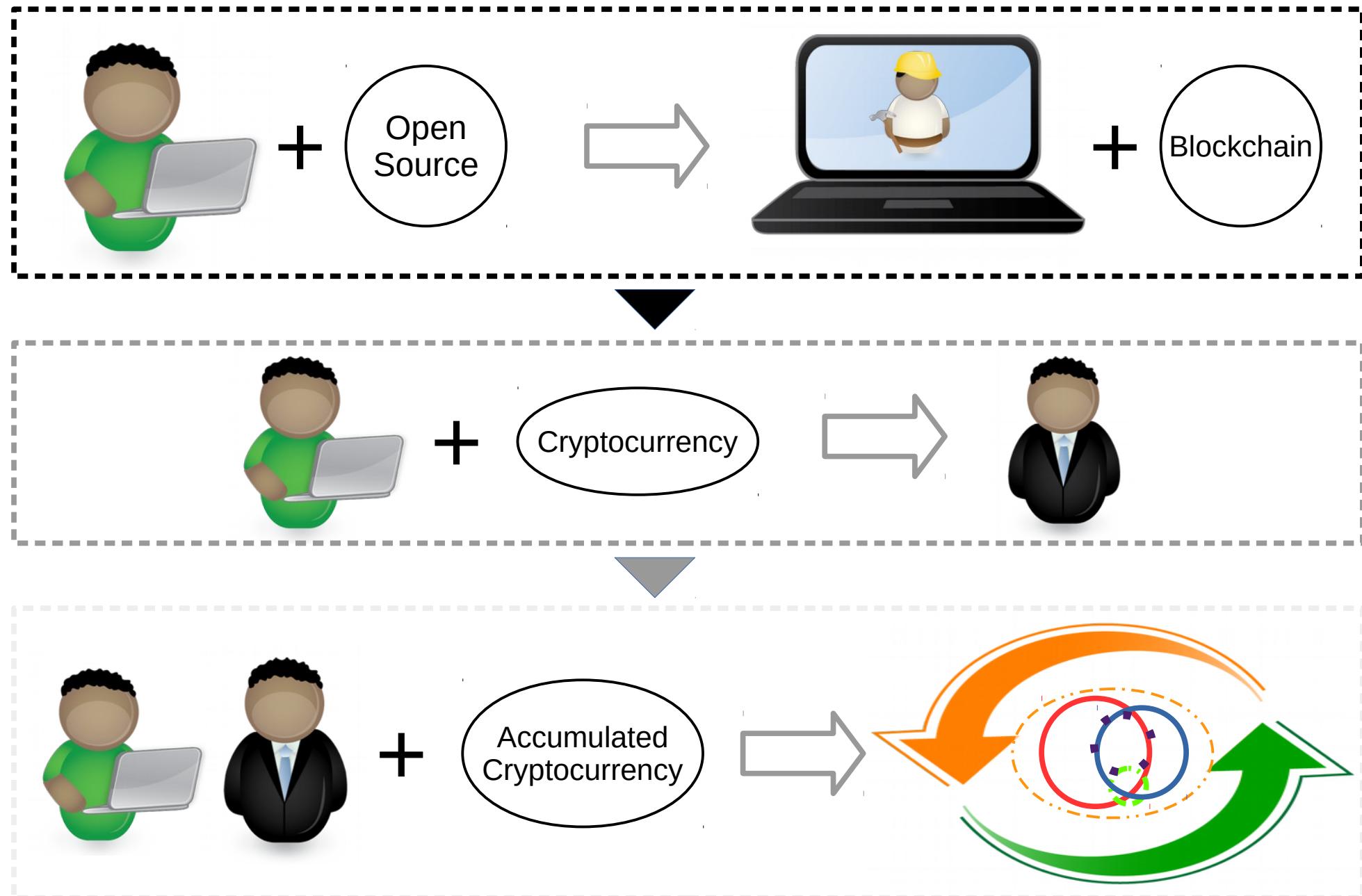
Heterogeneous Mix of Multiple, Simultaneous Micro- and Macro-Spatial Processes

# Blockchain Framework – Core Concepts



# Political Economy

# Blockchain Ecosystem Relations and Transitions

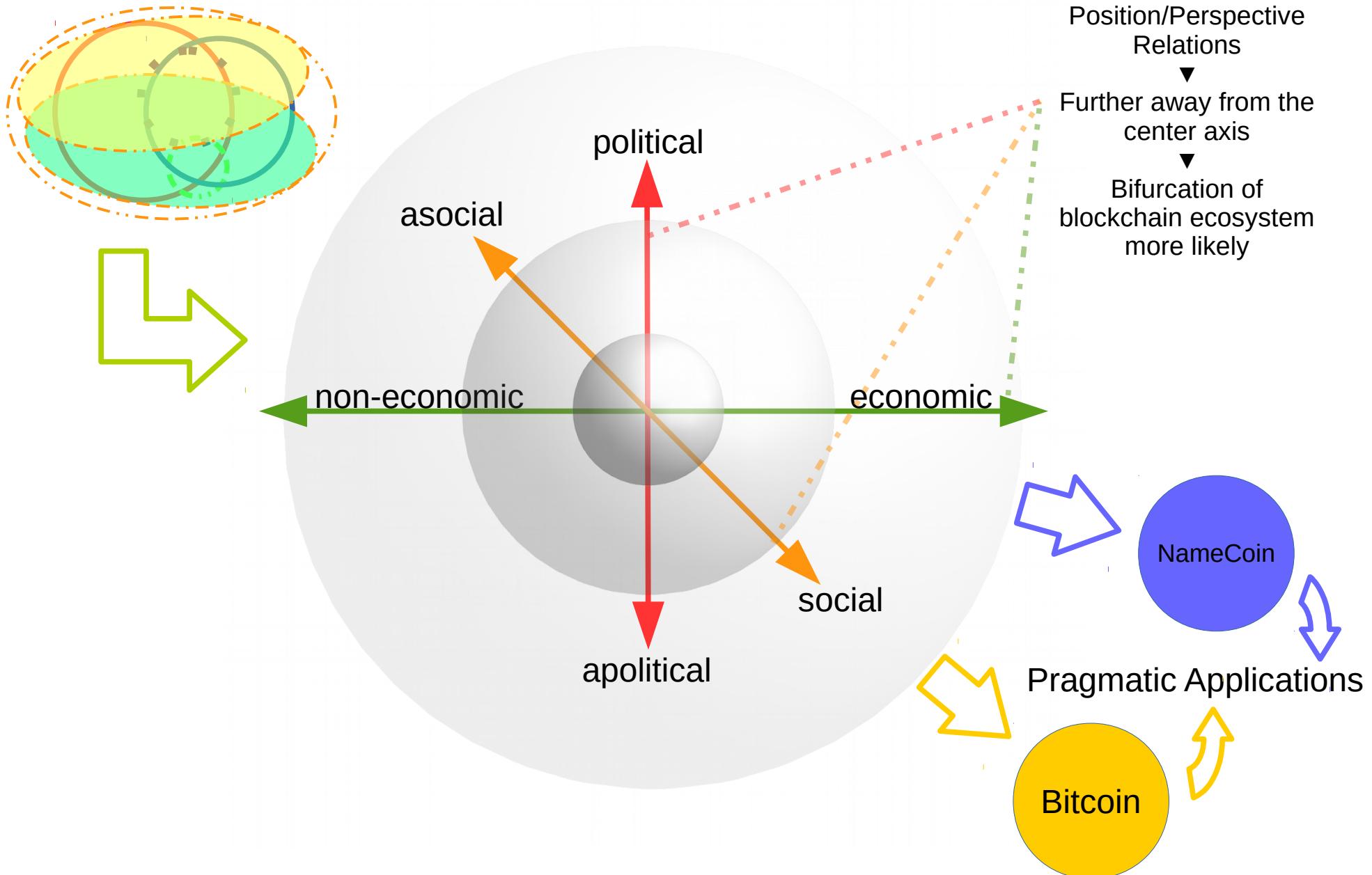


Source: Joe Blankenship

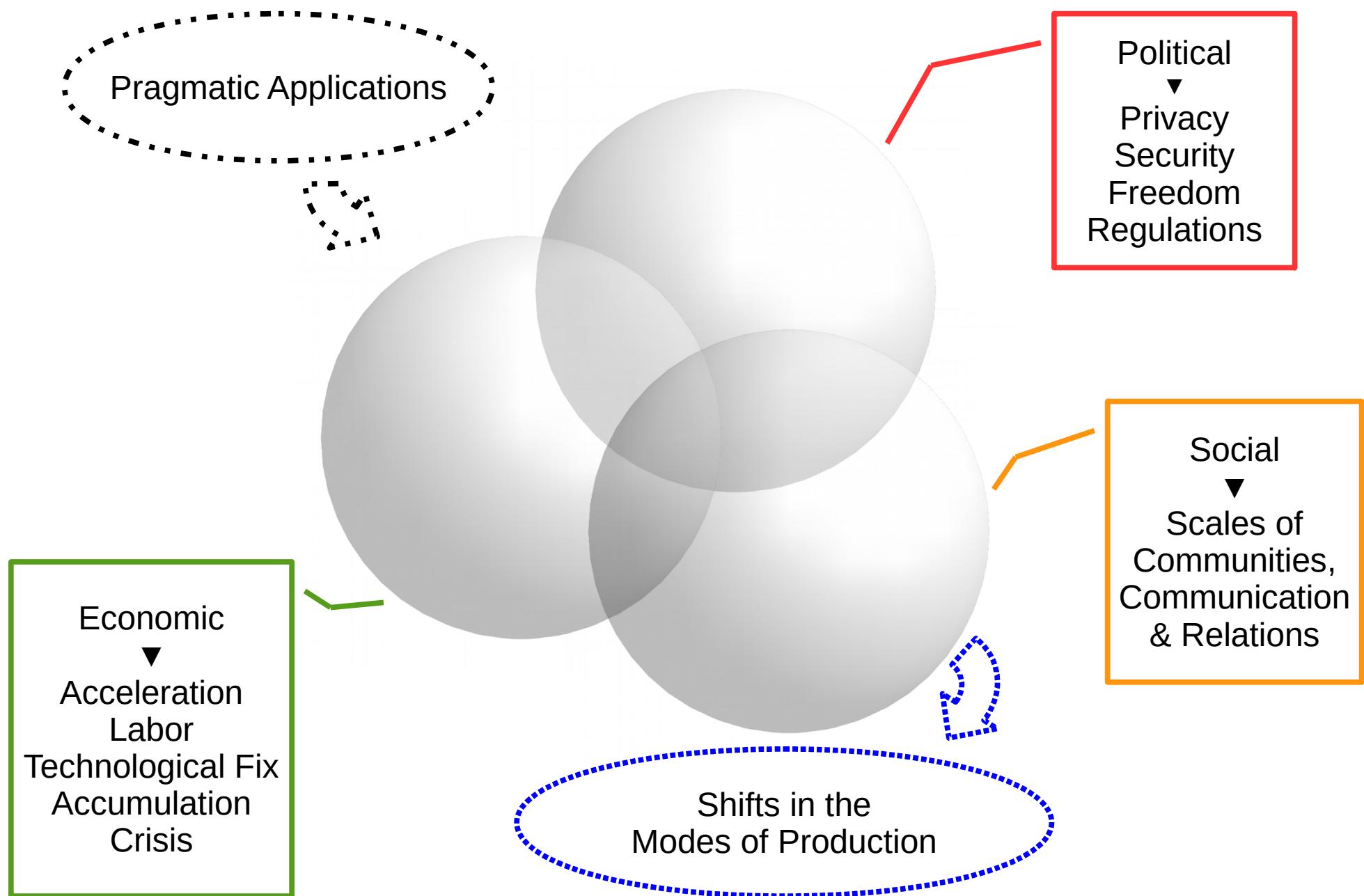
# Perspectives and Positions

Positions Perspectives	Developer	Investor	User
Development	Investment of Time Innovation Use-case	Manifest the Pragmatic Application per Use-case	Bolster/Contest the Pragmatic Application per Use-case
Investment	Manifest the Pragmatic Application per Use-case	Economic ecosystems Political Investment Social Dynamics	Invest Money Token Value Use
Utility	Bolster/Contest the Pragmatic Application per Use-case	Invest Money Token Value Use	Social Dynamics within Sentiment per Use-case

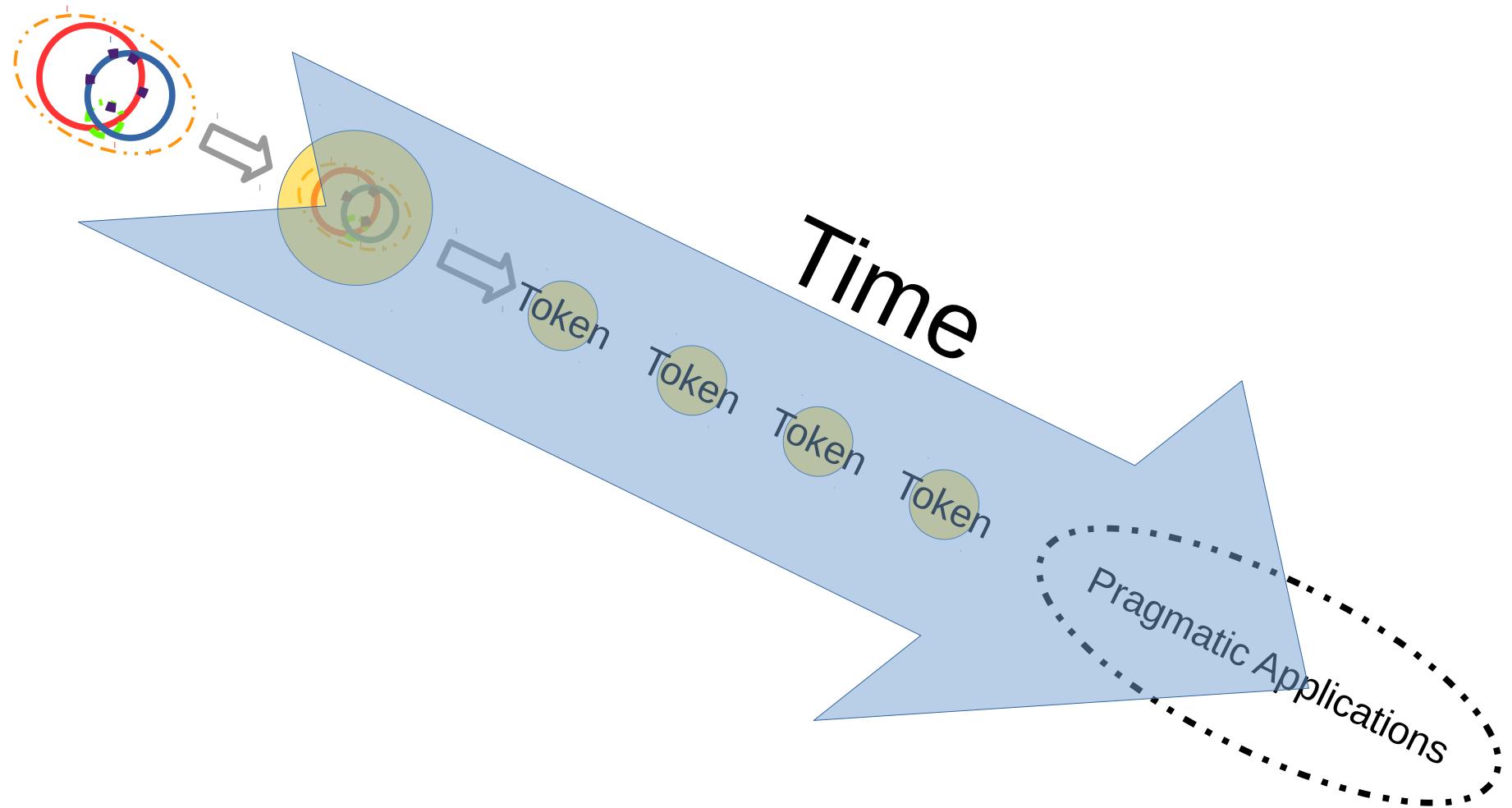
# Heterogeneity via Sentiment



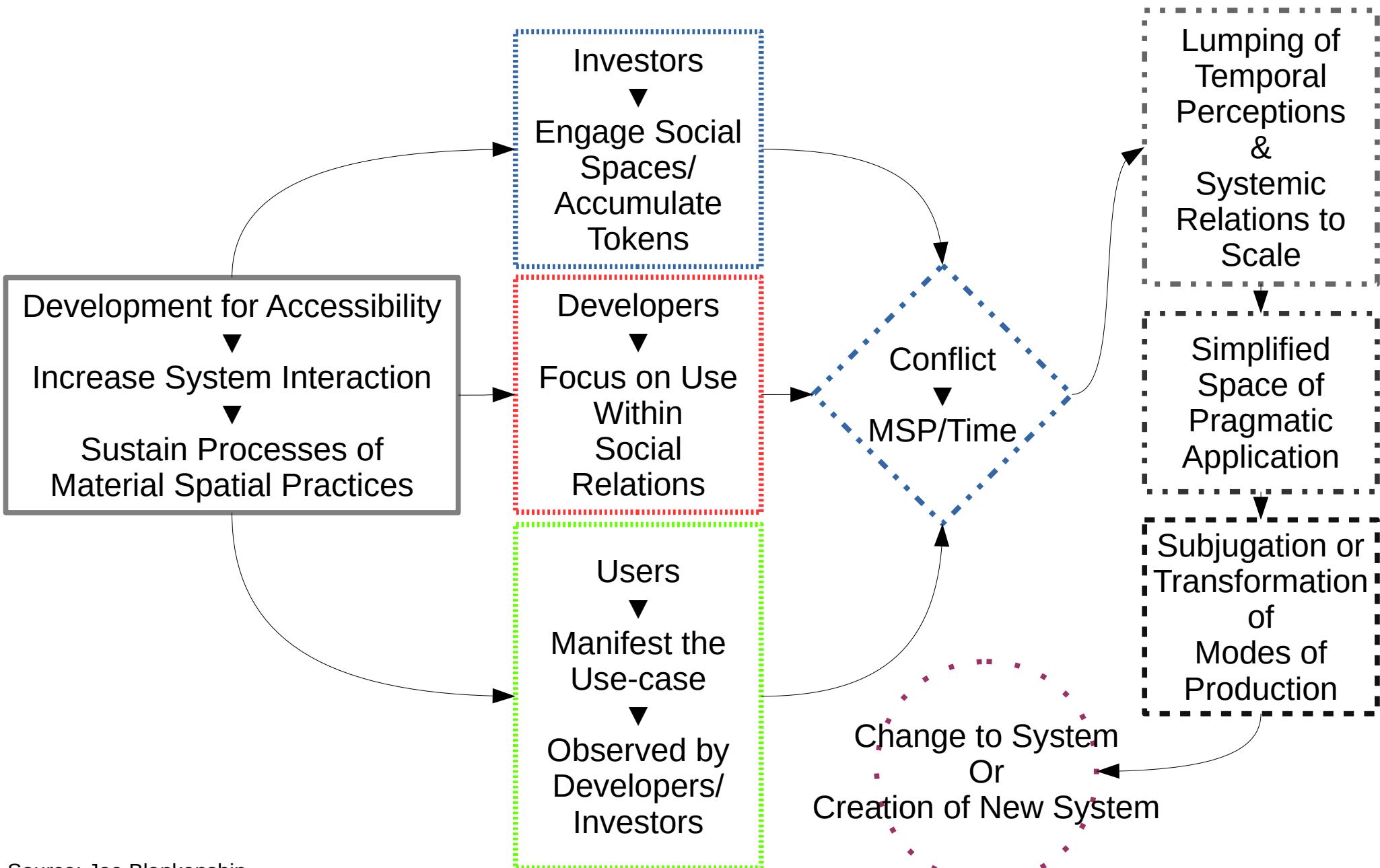
# Modes of Pragmatic Application Production



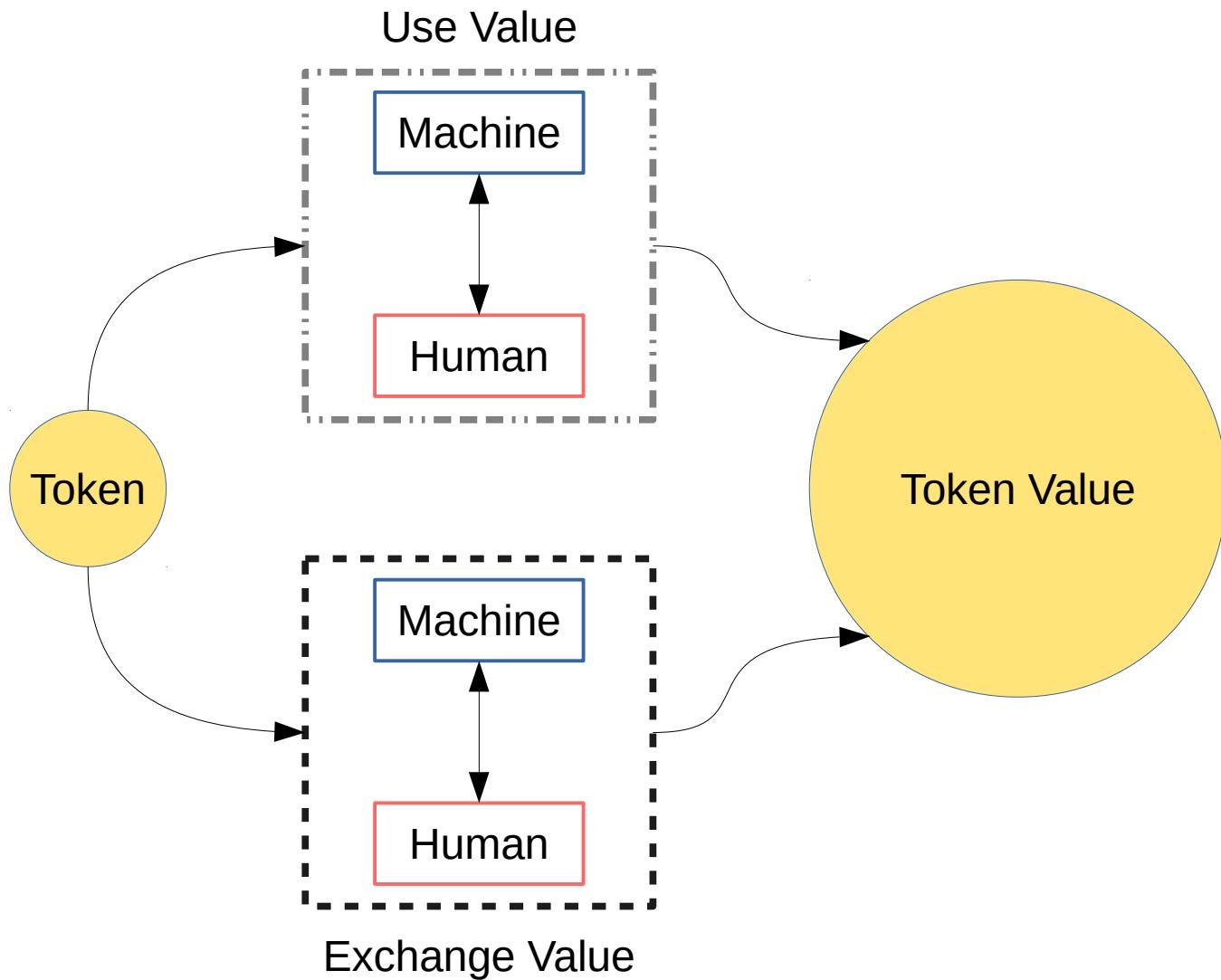
# Blockchain Space subdued by Time



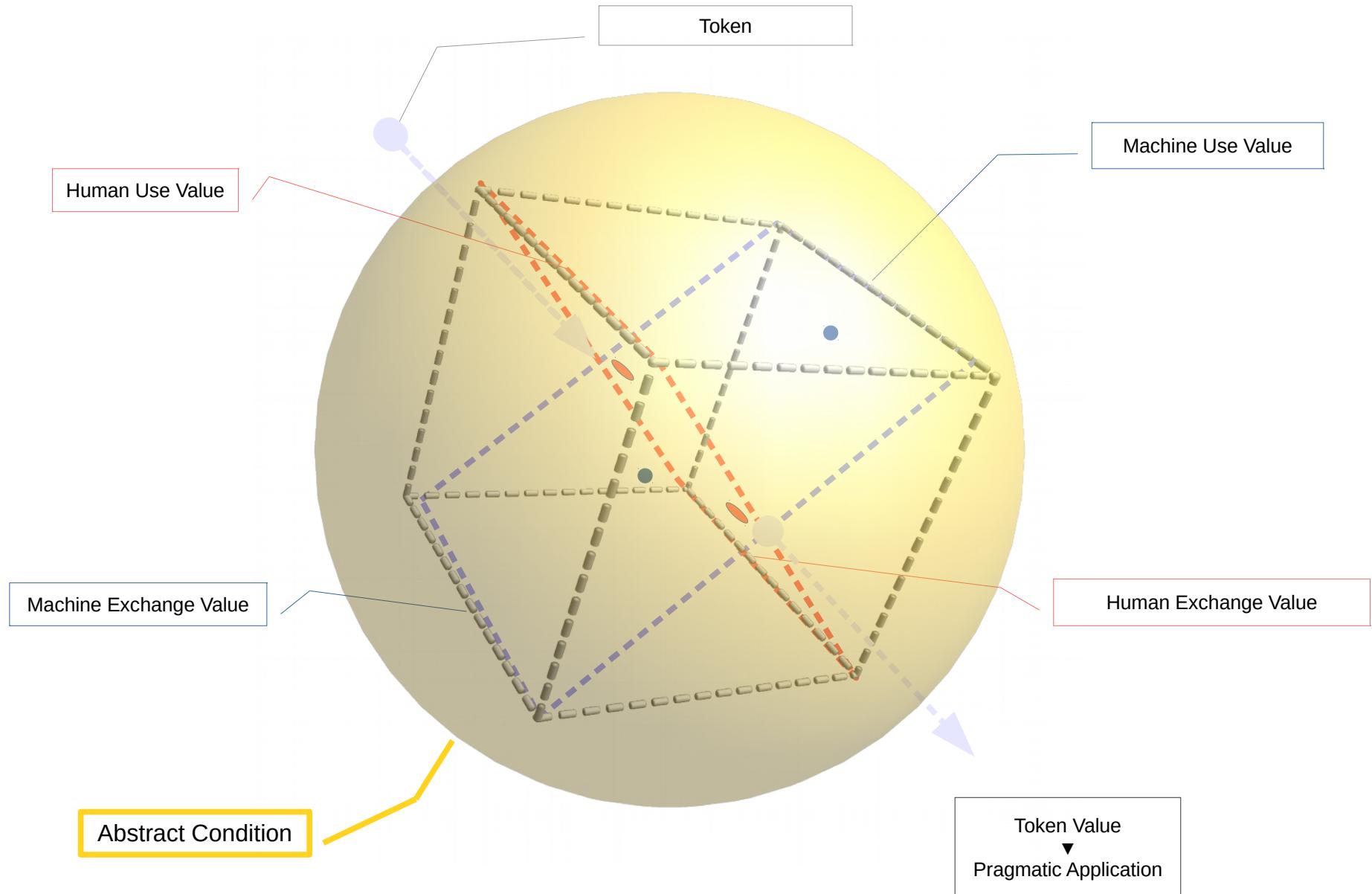
# Resolution of Space/Time Conflicts



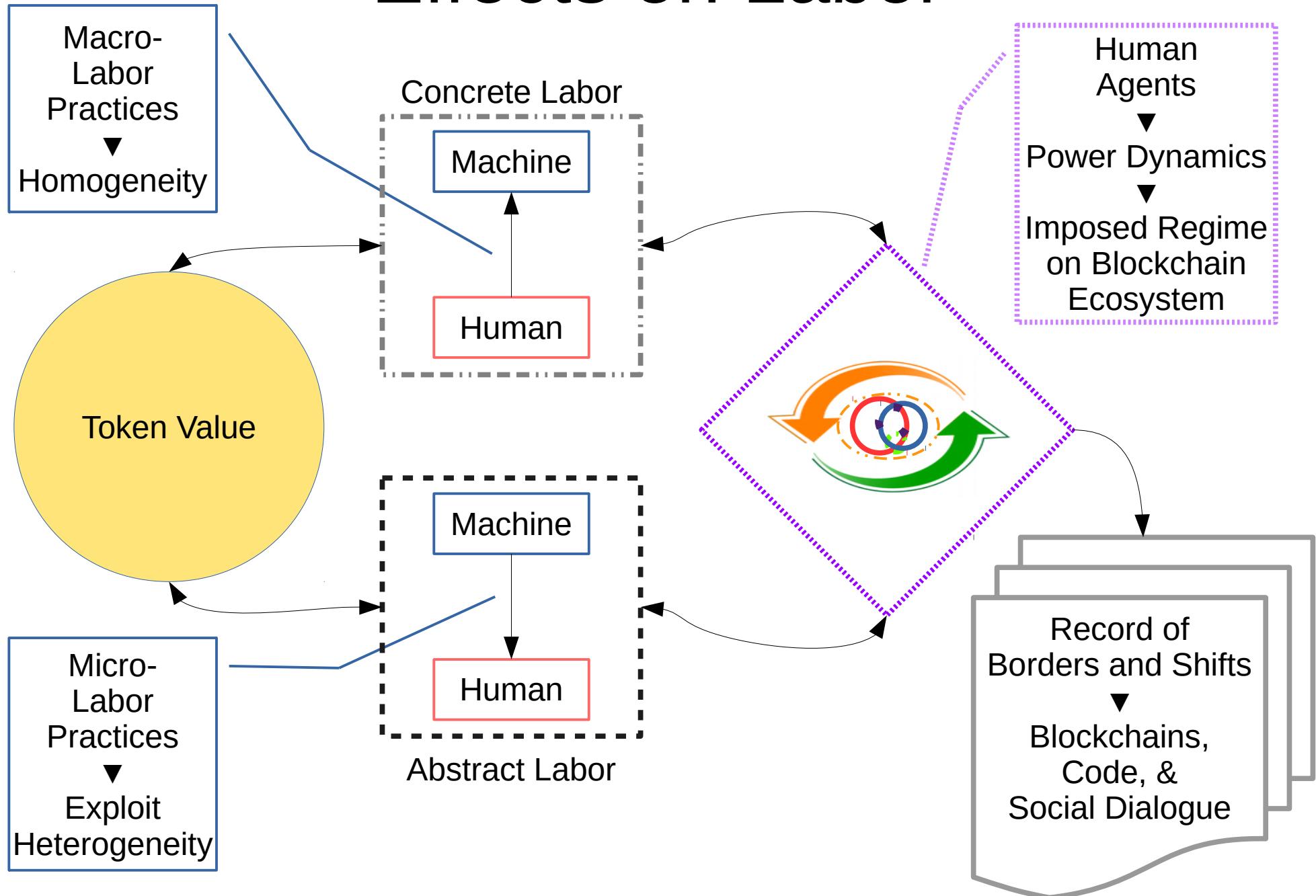
# Token Value Formation



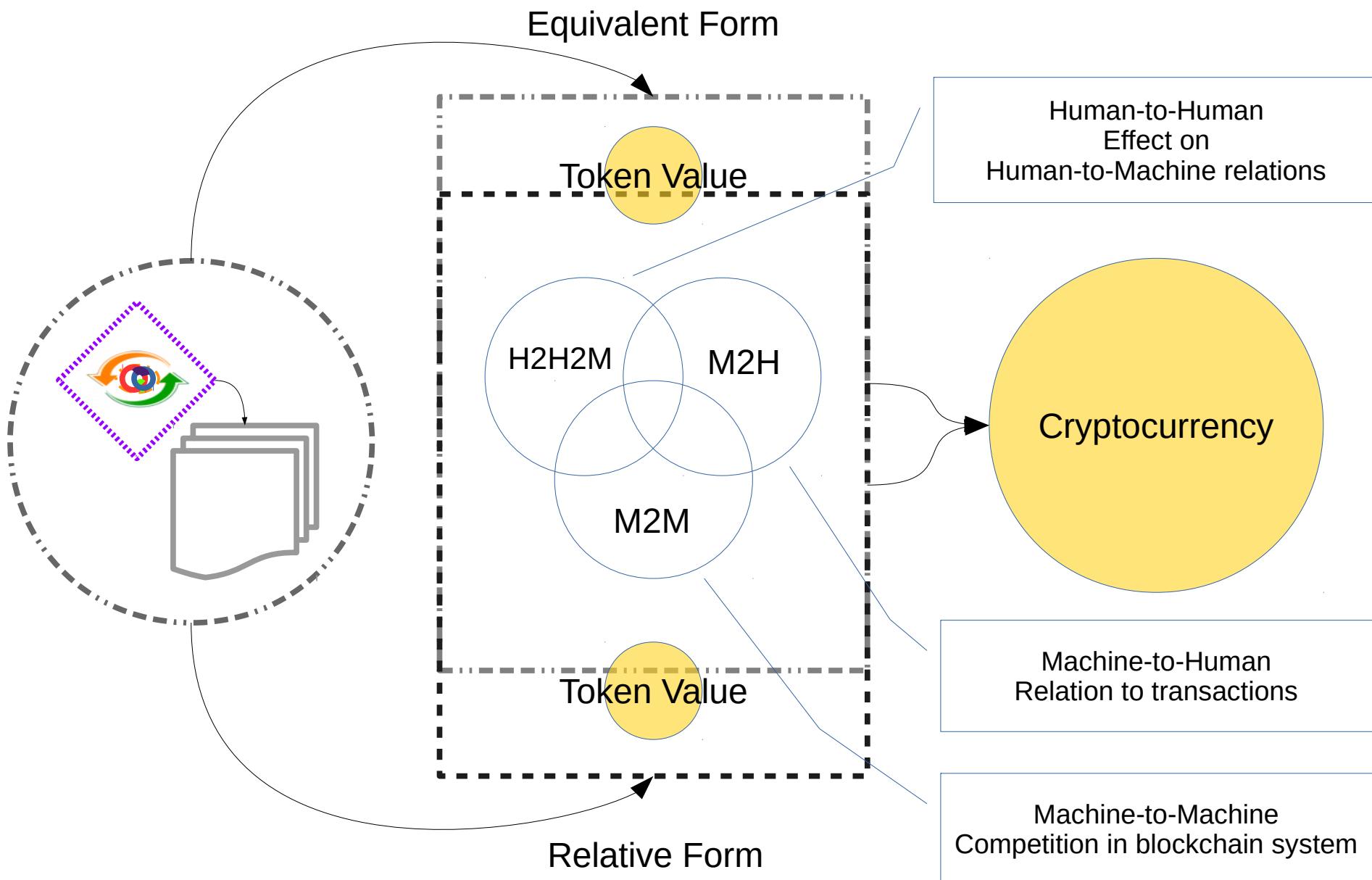
# Token Value Dialectic Structure



# Effects on Labor

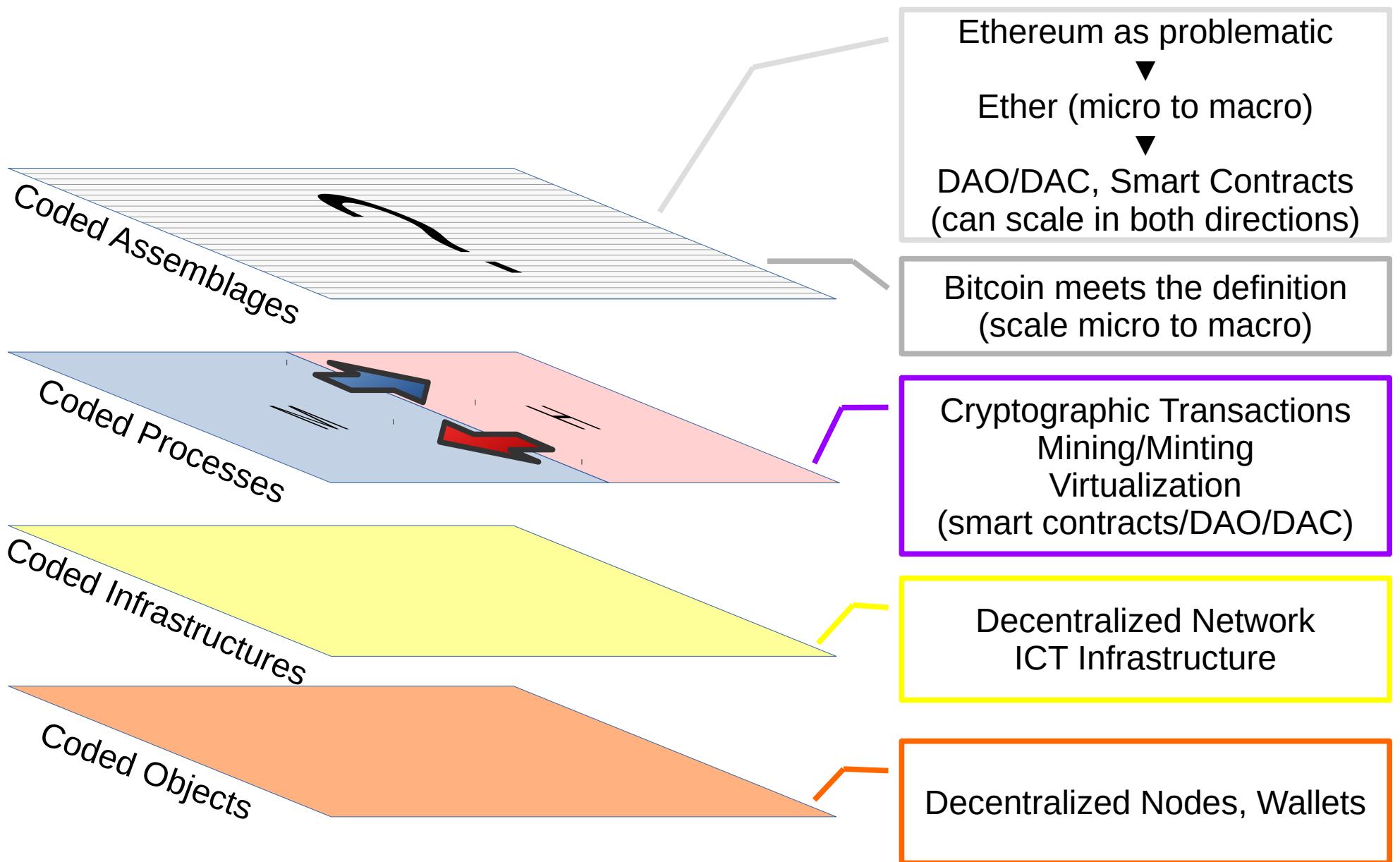


# Technological Fixes & Class Dynamics

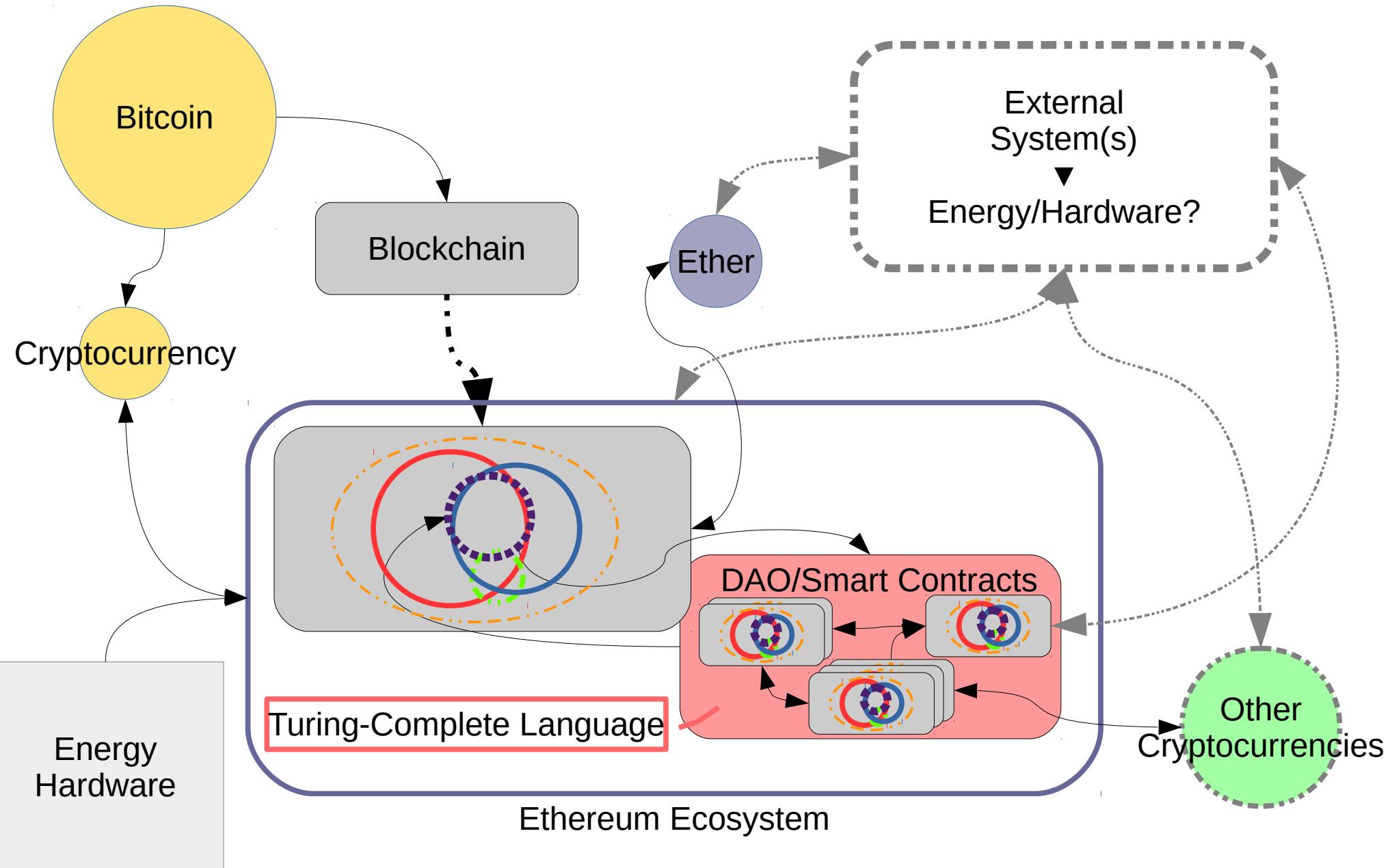


# Code/Space

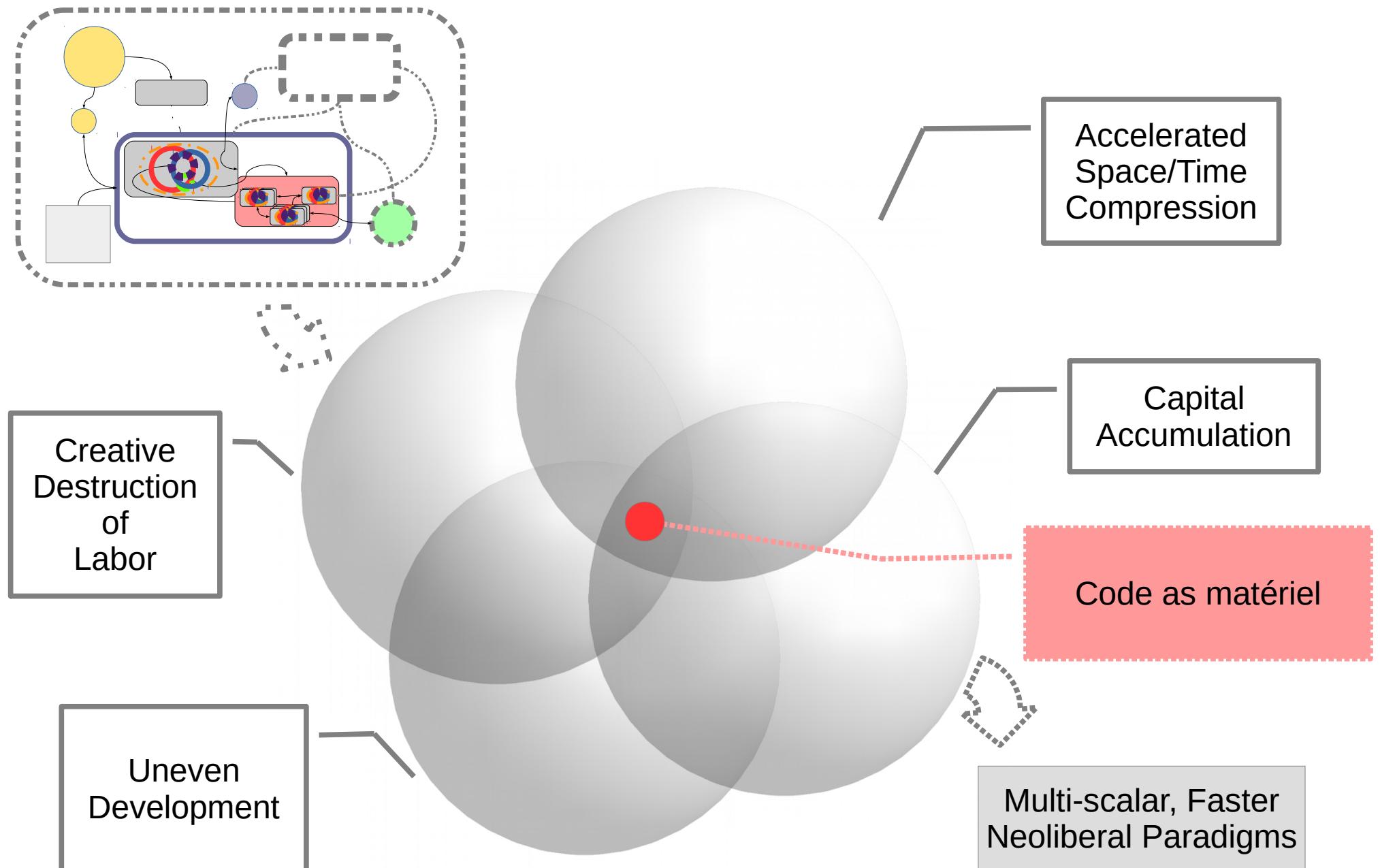
# Blockchain Code/Space Levels of Activity



# Potential Processes of Collective Autonomous Life (Ethereum)



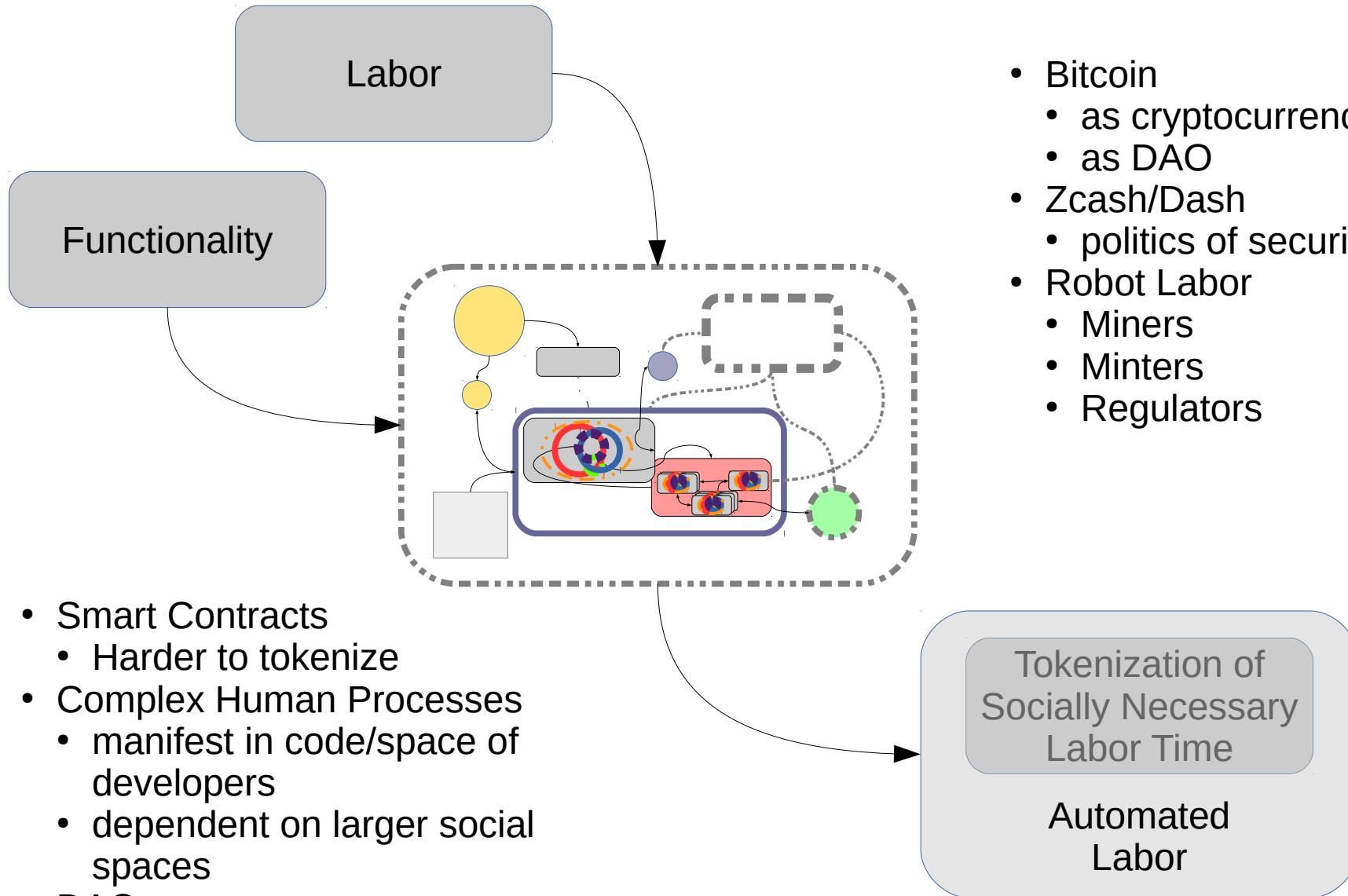
# Potential Effects of Blockchain Technicity



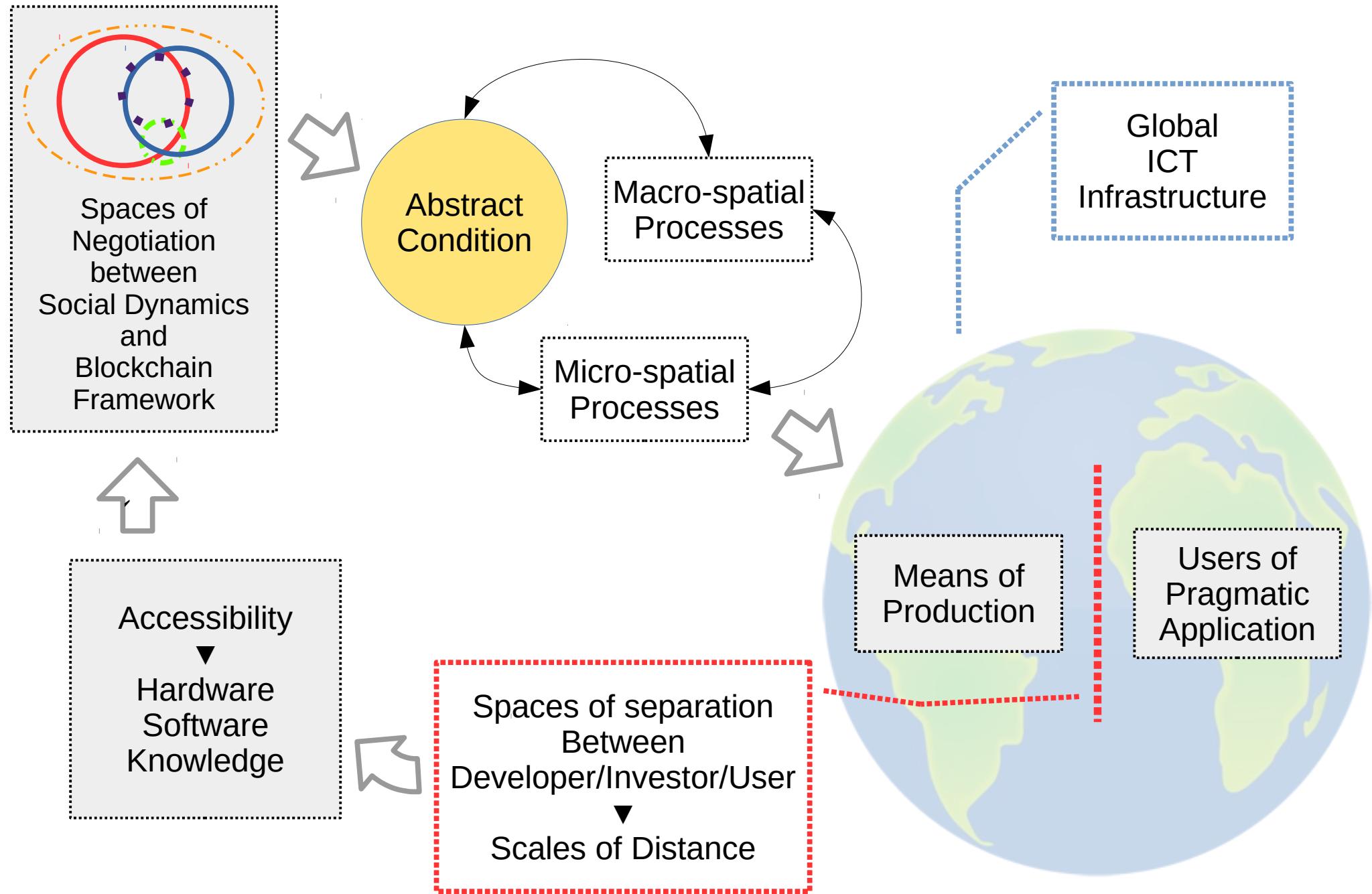
# Code as a Product

- Through processes of its
  - Conception
  - Manifestation
  - Abstraction
  - Discursive relations
- Effects on Spaces of Everyday Life
  - Material Spatial Practices
  - Automation
    - Obfuscate/Resolve Internal Conflicts
    - Facilitates Processes of Spatial Reproduction/Reconstruction

# Blockchain Code/Space Transduction

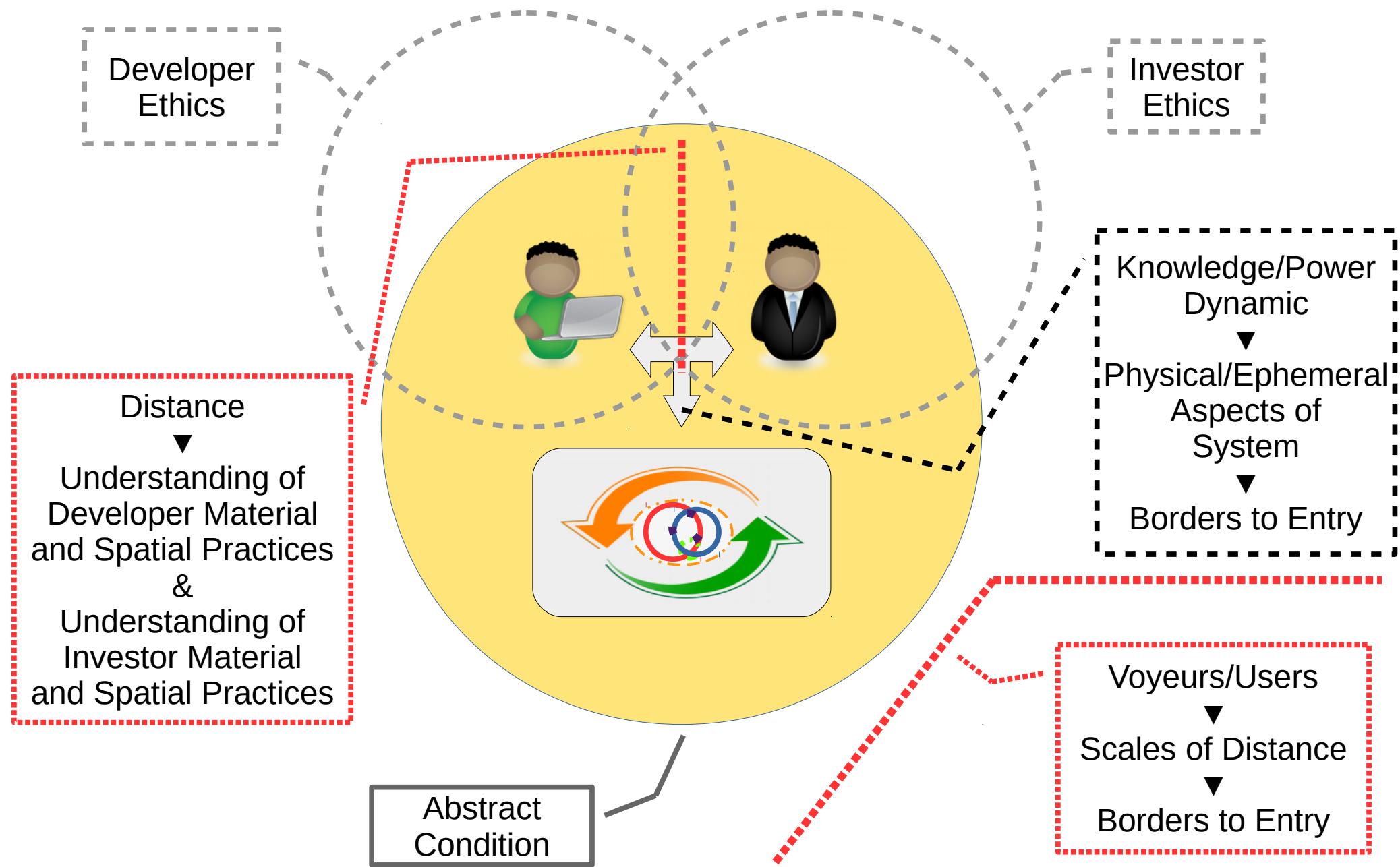


# Blockchain Scaling & Network Society



Source: Joe Blankenship

# Blockchain Scaling & Network Society



# Conclusion

# Conclusion

- Blockchain technologies are not revolutionary
  - But have the potential to be
- Developers currently dominate these spaces
  - Control means of production
  - Processes of reproduction
- Investors
  - Guide sentiment (the abstract condition) of modes of spatial production
- Use-case
  - Pragmatic application integrates within means and modes of production
- Transfer of agency
  - Human/machine dialectic of automated labor
  - Gives form, function, and structure to that network, framework

# Conclusion

- Developers translate coded language
  - Reddit and other social spaces as forum for investors and users to understand these systems
- Process of token to cryptocurrency
  - Internal contradictions
    - Abstracted within token value processes
  - Human/machine dynamics in blockchain framework
    - Scale, simultaneity, multiplicity
    - Technological fixes
- Neoliberal capitalist production
  - Means, modes, mindsets
  - Material spatial practices

# Conclusion

- Code/space
  - Many symmetries between two theoretical frameworks
    - Blockchains expose bifurcations and challenges those symmetries
  - Coded infrastructure and coded assemblages
    - Further examination of how blockchains and DAOs fit
  - Micro-spatial distances create borders at varying scales
    - Still dominated by humans over abstract condition
      - Affecting human/machine space of blockchain code/space
    - Shifts in scales of spatial production produce borders
      - Via conflicting abstract conditions
  - Transduction encapsulates crises in these systems

# Limitations

- Relevant literature
- Number of participants
- Involvement with developers
- Development of open-source tools
  - Processing, Analysis, and Visualization
- Robot labor and AI related to blockchains

# Significance

- Advances cyber geographic studies
  - Code/space
  - Information society
  - Actor-network theory
  - Robot labor and weak AI
- Political economy of blockchain systems and cryptocurrencies
  - Contextualizes increased use of blockchain in political and economic spaces
  - Defines cryptocurrencies through their processes

# Thank You!

Joe Blankenship

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# Additional Slides

# Introduction

- Technology is already geographically dominant
  - Software, Hardware, Mindsets
- Evolution of cyber geographies
- Relationships to capital
  - Increased efficiency & crisis
- Cryptocurrencies & blockchains
  - Increasing usage
  - Finance, government, & everyday life

# Literature Review

# Cyberspace

- Far beyond the Internet and WWW
- From
  - Accelerated communication
  - Shrinking of space
- To
  - Digital landscapes of micro- and macro-scalar evolutions
  - Automation of collective, socio-cognitive spaces
  - Web 3.0 and data auto-generation

# Political Economy of Modes of Spatial Production

- Henri Lefebvre's *The Production of Space*
  - Control of space enhanced through technology
  - New socially-produced spaces
- Doreen Massey's *For Space*
  - Simultaneity and multiplicity
  - Living processes of constant construction
- David Harvey
  - time-space compression
  - Dialectical materialism

# Bitcoin

- 3 core concepts
  - Public ledger (blockchain)
  - Cryptographic algorithm (encrypt/auth/trans)
  - Distributed network of computational nodes (miners)
- Wallets (public-key crypto)
- Proof-of-work
  - miners & hash values
- Altcoins, Metacoins, and Sidechains

# Ethereum

- Blockchain 2.0
- Turing-complete language & featureless blockchain
- Decentralized autonomous organization (DAO)
  - Internal capital to reward certain activity (Ether)
  - Autonomous actants at its core
  - Human acting upon/tasked by the system
- Decentralized autonomous corporations (DAGs)
  - DAO subclass, uses shares, can make a profit

# Theoretical Framework

# Phenomenology and the Production of Space

- A phenomenological approach
  - Personal experiences and knowledge
  - Developers, users, investors
  - Community and social spaces
- Perceptions and Positions
  - Human > system
  - System > human
  - Humans | systems | humans

# Dialectical Materialism and Cryptocurrencies

- Capitalist conditions
  - Bitcoin as currency
  - Ethereum as digital marketplace
- Spatial fixes
- Contradictions
  - Processes or things
  - Technology and labor
  - Uneven geographic development

# Systems Theory, Code/Space, and Network Societies

- System architectures
  - Bitcoin/Ethereum
  - DAOs/DACs
- Functional components
  - Narrow AI (miners)
  - Human I/O
  - Representations
  - Internal/external connections

# Systems Theory, Code/Space, and Network Societies

- Systems theory
- Cryptocurrency ecosystems
  - Flows
  - Network ecology
- Counter-argument
  - Borders
  - Distance
  - Limits to network analysis

# Open Conversations and Semi-structured Interviews

- Semi-structured Interviews
  - 5/20 participants
- Open-ended conversations
  - 16/30 participants (of 23 confirmed)
- Location
  - 17 USA, 2 Canada, 1 Southeast Asia, 1 Europe
- 13 developers, 8 Investors (3 users)
- 20/21 were men
- 28 thematic codes

# Open Conversations and Semi-structured Interviews

- History
  - Education, employment, path to Bitcoin/Ethereum
  - Mix of financial and social rationale
  - Some difficulty getting into blockchain space
  - DAOs-smart contracts important
  - Social interaction very important
    - Online developer communities
    - Investor conferences
  - Technology contextualized within individual political, economic, and social relations
    - Free markets, libertarian sentiment

# Open Conversations and Semi-structured Interviews

- Present
  - Many have employment related to blockchains
  - Ethics becoming more important
    - Development, regulation, identity, security, technical divide
  - Scale limits of blockchain systems
    - Increase user friendly interfaces
    - Systems used to help people
  - Developers still seen as dominant
  - Exposure to DAOs
    - Still need development, support, and research
    - Seen as a key indicator for investment

# Open Conversations and Semi-structured Interviews

- Future
  - Areas of impact
    - Disruption of economic systems
    - Social change
    - Grassroots efforts
  - Guiding forces
    - Geopolitical and geo-economic instability
    - People
      - Use-cases and customer demand
    - Regulations
    - Scalability and consensus
    - Immutability and trust

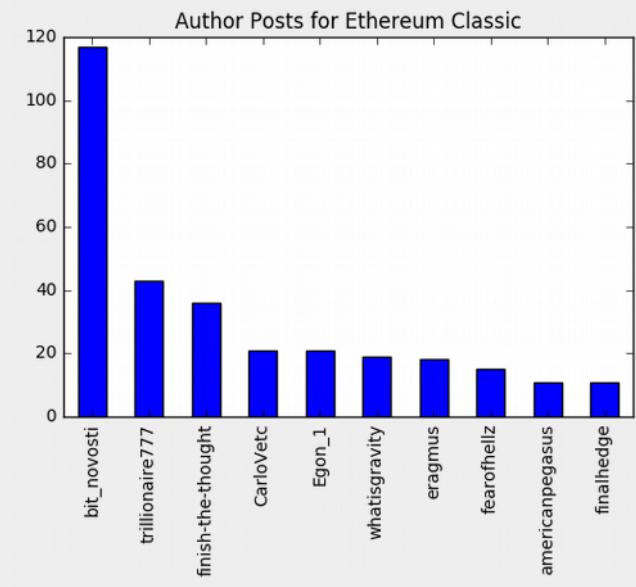
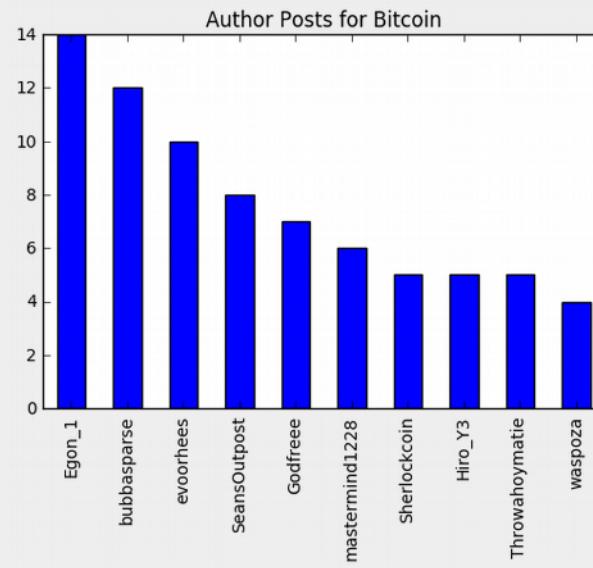
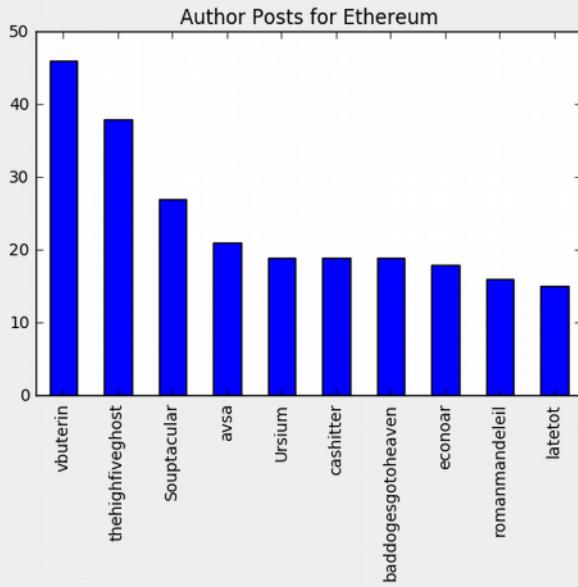
# Open Conversations and Semi-structured Interviews

- Accessibility
  - Access has improved over time
    - Simplification of wallets and applications
  - No solid idea of how to expand to disadvantaged populations, but believe potential was there
- Ethics
  - Many found this difficult to answer
  - Formed around two main areas
    - How one defines value
    - How one defines people and their time
  - Determined by social spaces
    - Activism
    - Ethics in developer's code
    - Regional legal framework

# Ethereum, Bitcoin, and Ethereum Classic Subreddits

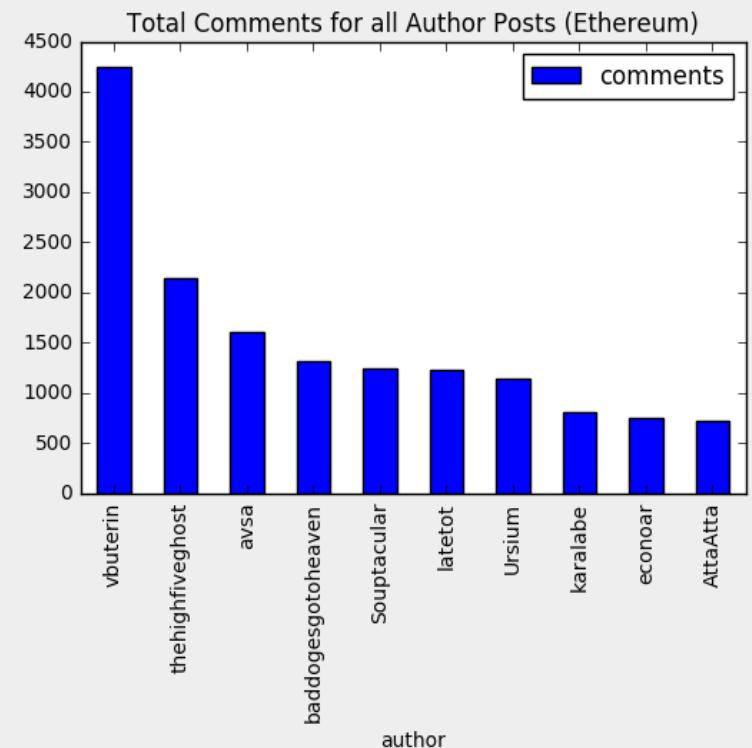
- Reddit
  - Top 1000 threads for BTC, ETH, and ETC
    - Web scraped with Scrapy
    - CSV output (JSON initially)
  - Analysis
    - Reading of all the content
    - CSV to DataFrame with Pandas
    - Authors, Time, Comments, and/or Title content
    - Compare content within and across subreddits
    - Word clouds and word frequencies
    - Compare content to Interviews/Open Conversations

# Subreddits - Author Posts



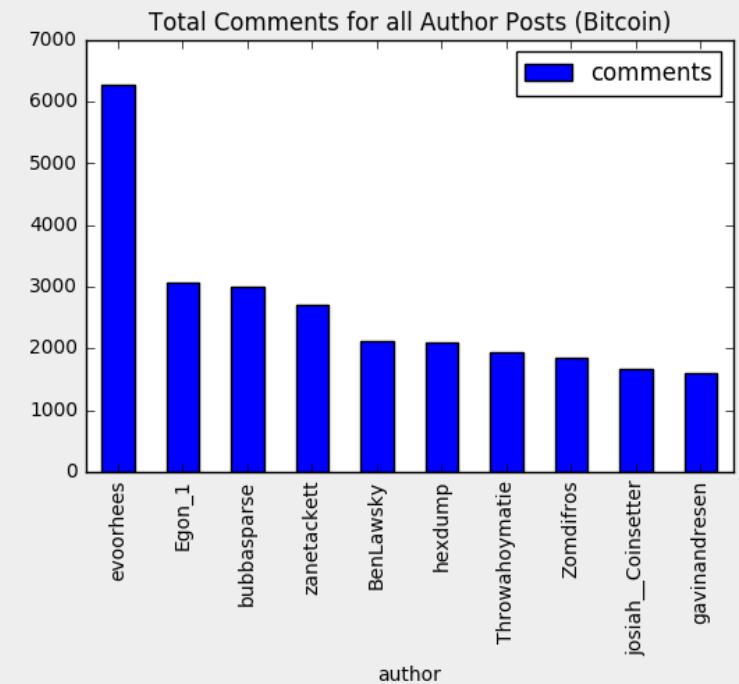
# Ethereum – Author Posts

	author	comments	title
36	thehighfiveghost	1006	Critical update RE: DAO Vulnerability
0	vbuterin	843	Personal statement regarding the fork
74	latetot	558	The ability to reverse exploits that violate t...
17	vbuterin	509	The Current HF Status
53	AttaAtta	494	An Ethereum hard fork is not a bailout it's fo...
25	Rune4444	482	A "too big to fail" political hard fork is ver...
168	VoiceOfTheEvolution	392	Devil's Advocate: What incentive is there for ...
10	ledgerwatch	390	I think TheDAO is getting drained right now
42	GloomyOak	374	It seems attacker just targeted the WhiteHatDAOs
148	ProHashing	369	Why Ethereum should fork



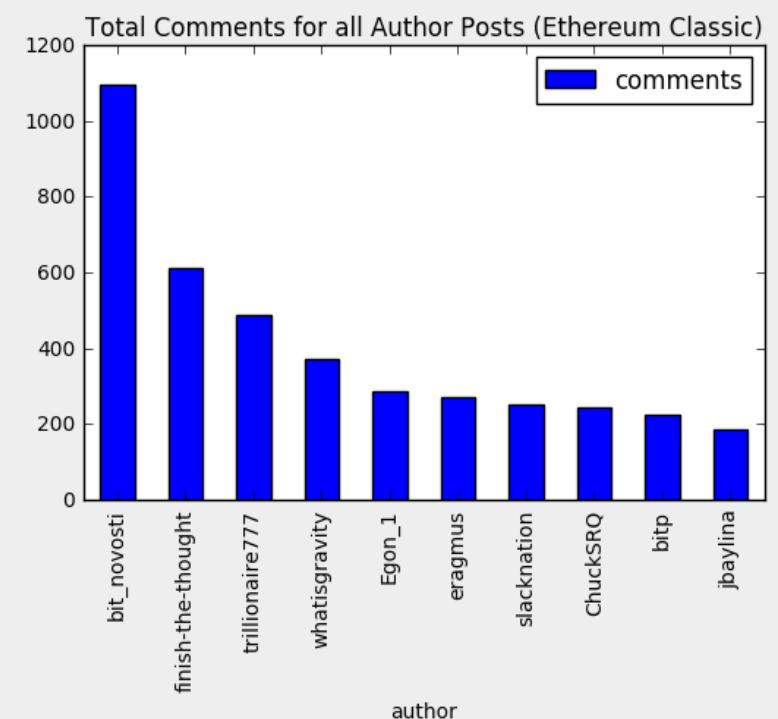
# Bitcoin – Author Posts

	author	comments	title
794	zanetackett	2713	Bitfinex security breach: Trading will be halt...
76	evoorhees	2137	Some words for my friends
410	BenLawsky	2129	Hi, this is Ben Lawsky at NYDFS. Here are the ...
13	hexdump	2100	Silk Road operator Ross Ulbricht to sentenced ...
89	Zomdifros	1843	The Face Behind Bitcoin: Satoshi Nakamoto is.....
366	josiah__Coinsetter	1658	IRS declares Bitcoin as property, not currency
103	SecretCheese	1567	Silk Road website founder Ross Ulbricht found ...
36	l0gz	1511	REAL Satoshi Nakamoto denies being Dorian Naka...
15	evoorhees	1455	Open Letter to Michael Casey - WSJ reporter wh...
238	WeAreMtGox	1400	We are Mt. Gox: AMA

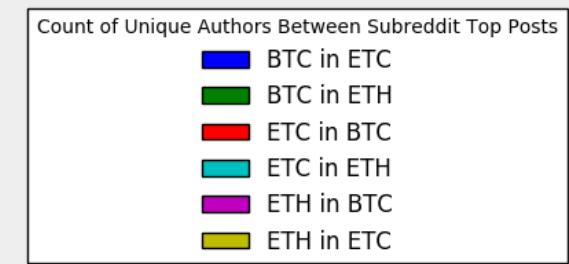
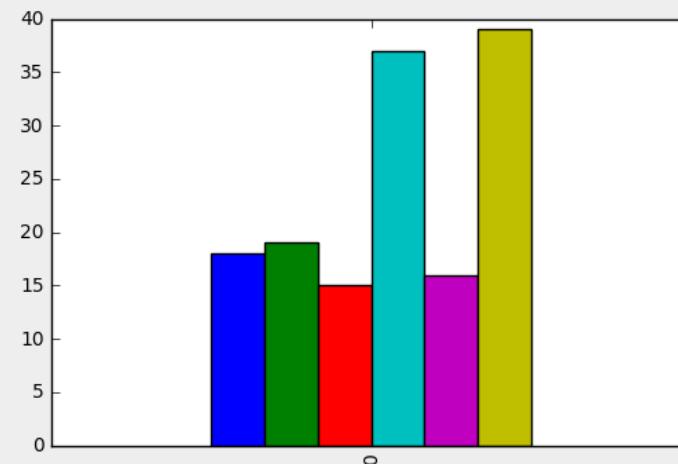
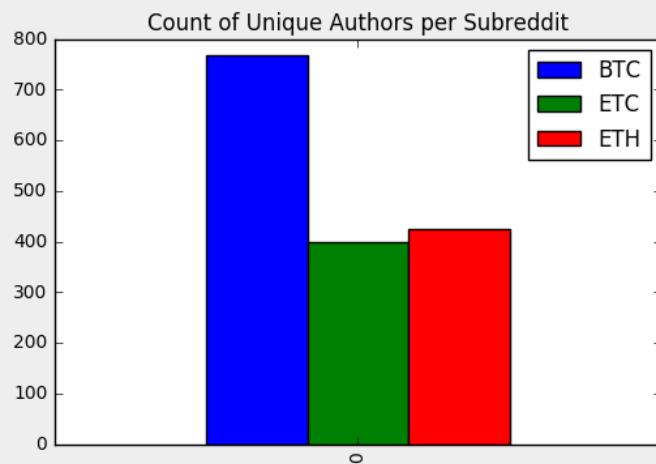


# Ethereum Classic – Author Posts

	author	comments	title
188	ttggthhh	162	Alex van de Sande (/u/avsa) and the rest of th...
22	jbaylina	144	Follow Up Statement on the ETC Salvaged from a...
59	publius2050000	128	Declaration on the Future of Ethereum Classic
48	slacknation	121	white hat went rogue
9	biglambda	99	Vitalik Buterin says he won't support ETC even...
88	TheRandyMagnum	98	Charles Hoskinson on ETC, "Devs are coming."
179	LGuappo	97	Serious question: What do you guys think the a...
99	Newbium	97	Barry Silbert To Buy ETC Until It Reaches ETH ...
1	bit_novosti	96	Hard fork went smoothly, Ethereum Classic chai...
0	bit_novosti	94	Call for action: What can I do to help Ethereu...



# Unique Authors between Subreddits

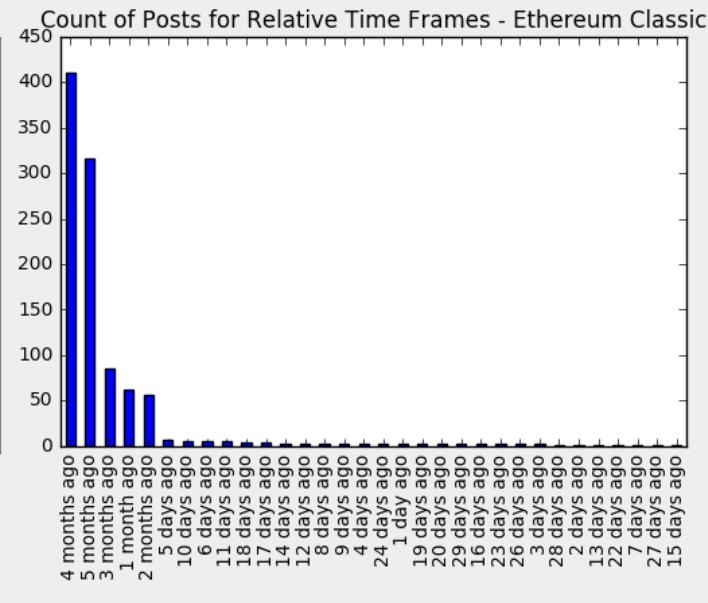
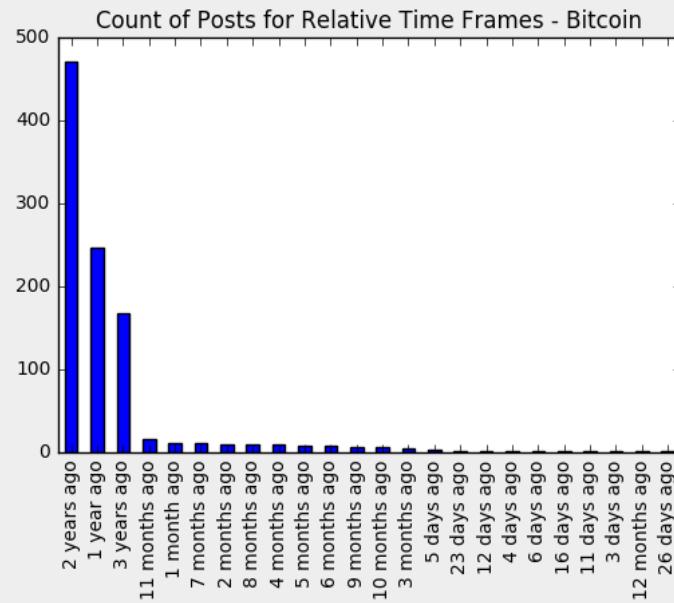
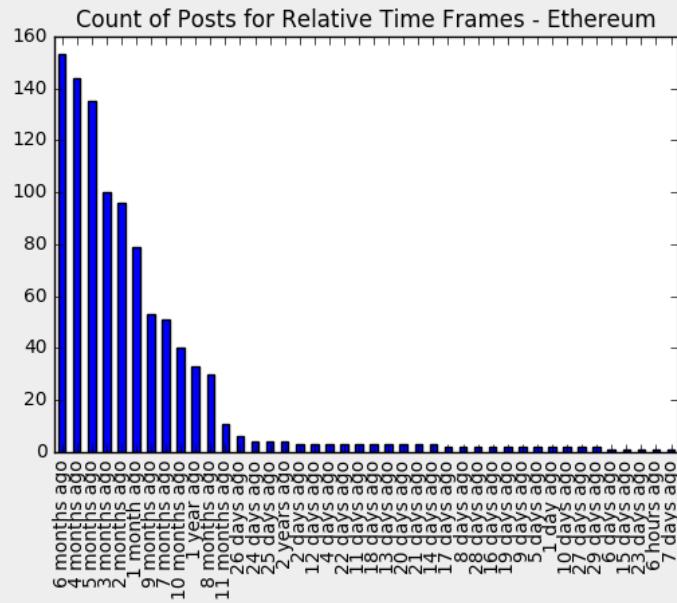


	BTC in ETC	BTC in ETH	ETC in BTC	ETC in ETH	ETH in BTC	ETH in ETC
0	18	19	15	37	16	39

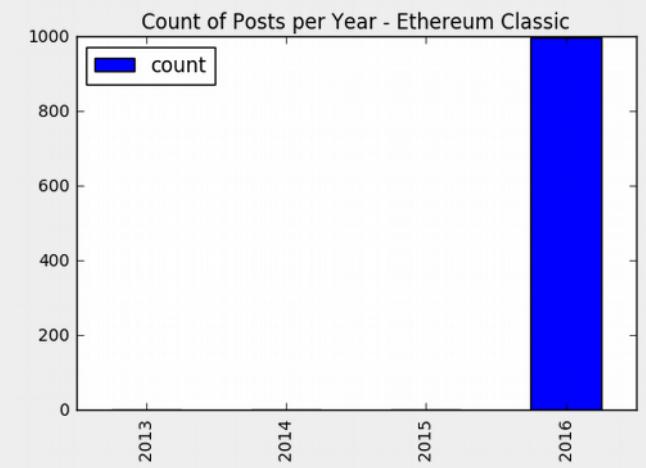
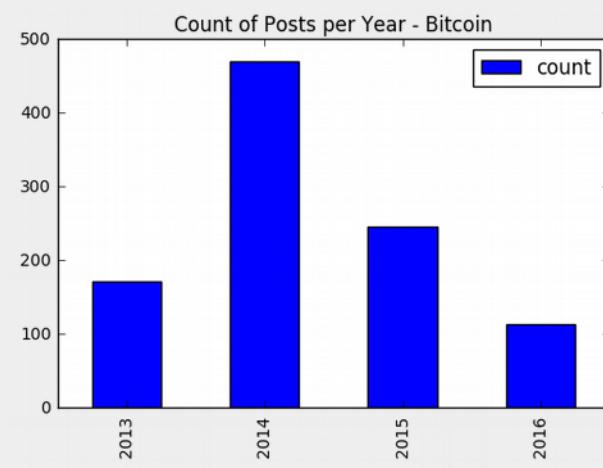
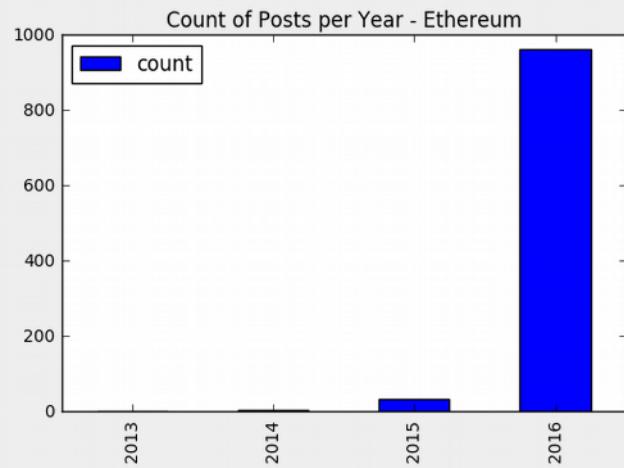
# Unique Authors between Subreddits

names	btc_in_eth	eth_in_btc	btc_in_etc	etc_in_btc	eth_in_etc	etc_in_eth
nugget_alex	0	0	0	0	1	1
FredEE	1	1	0	0	0	0
Jusdem	0	0	0	0	1	1
instantether	0	0	0	0	1	1
ChuckSRQ	0	0	0	0	1	1
idlestabilizer	1	1	0	0	0	0
insomniasexx	0	0	0	0	1	1
AroundTheBlock_	0	0	0	0	1	1
Bidofthis	1	1	0	0	0	0
fearofhellz	0	0	1	1	0	0
Joloffe	0	0	0	0	1	1
Tralx	0	0	0	0	1	1
adliorio	0	0	0	0	1	1
OperationNine	0	0	0	0	1	1
alistairmilne	0	0	1	1	0	0
Satoshi-	0	0	1	1	0	0
finalhedge	0	0	1	1	0	0
bitcoinsberlin	0	0	1	1	0	0
romanmandeleil	0	0	0	0	1	1
evoorhees	1	1	0	0	0	0
drcode	1	1	0	0	0	0
101111	1	1	0	0	0	0
kyletorpey	1	1	0	0	0	0
americanpegasus	0	0	1	1	0	0
Sherlockcoin	1	1	0	0	0	0
jbaylina	0	0	0	0	1	1
BokkyPooBah	0	0	0	0	1	1
raithe1337	0	0	0	0	1	1
bookelections	0	0	0	0	1	1
cap2002	1	1	0	0	0	0
madhatter3D	0	0	0	0	1	1
bitpotluck	0	0	1	1	0	0
lcvella	0	0	0	0	1	1
lozj	0	0	0	0	1	1
CrystalETH_	0	0	0	0	1	1
Ezekial25	0	0	1	1	0	0
vbuterin	1	1	0	0	0	0
Egon_1	1	1	1	1	1	1
bdarmstrong	1	1	0	0	0	0
zanetackett	0	0	1	1	0	0
seweso	0	0	0	0	1	1
aakiffernandes	0	0	0	0	1	1
Crypto_Economist42	0	0	0	0	1	1
hermanmaas	0	0	0	0	1	1
MemoryDealers	0	0	1	1	0	0
BitcoinXio	1	1	0	0	0	0
jespow	0	0	1	1	0	0
zr1trader	0	0	0	0	1	1

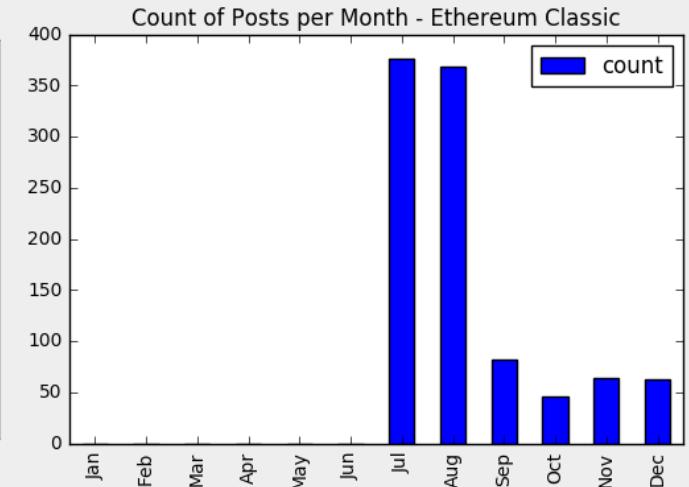
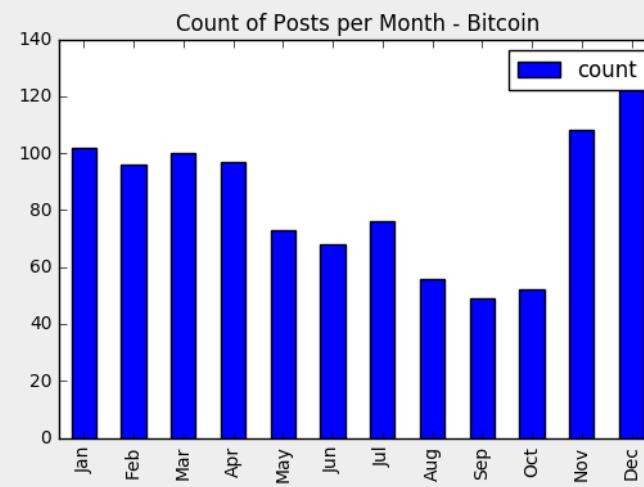
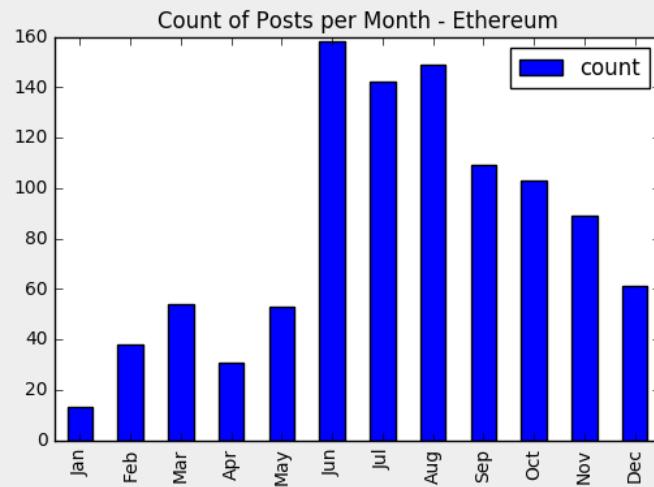
# Count of Posts for Relative Times



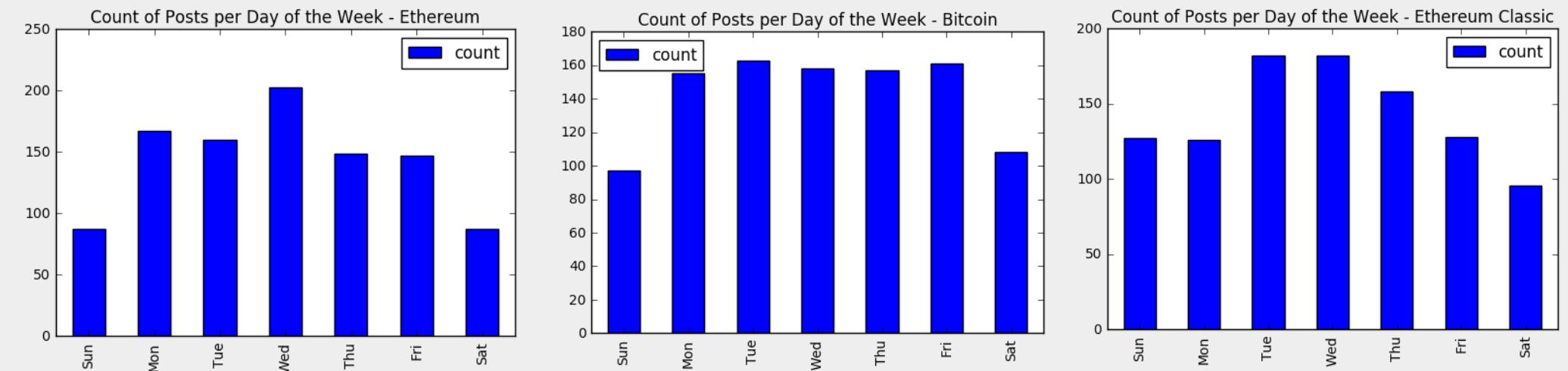
# Count of Posts per Year



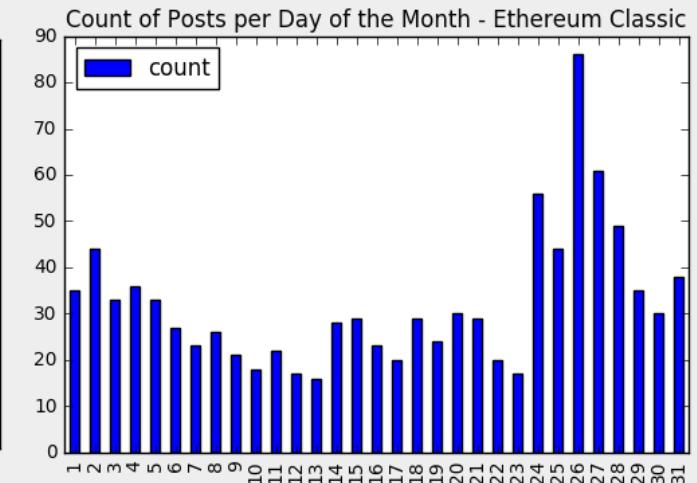
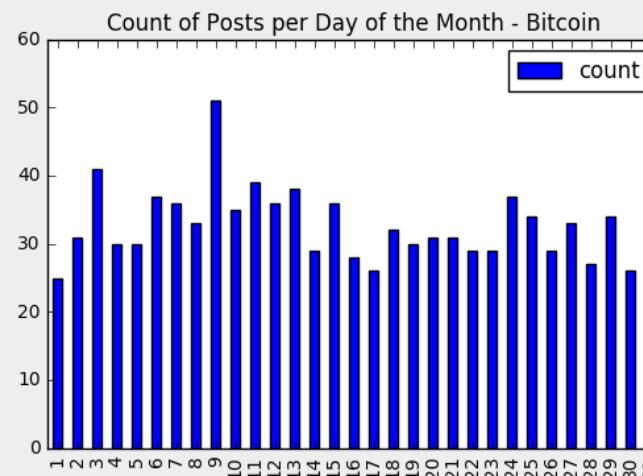
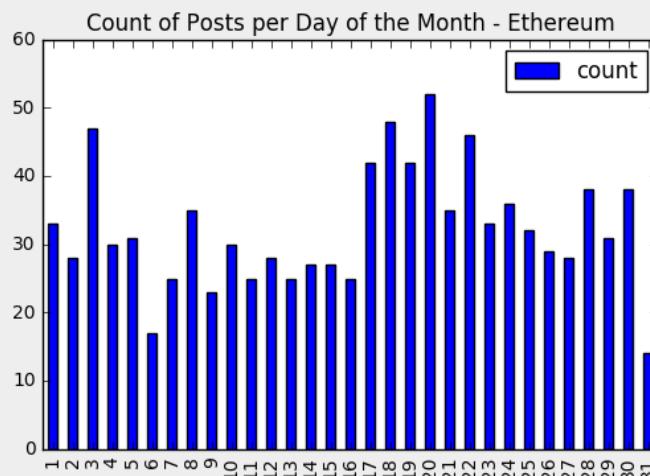
# Count of Posts per Month



# Count of Posts per Day of the Week

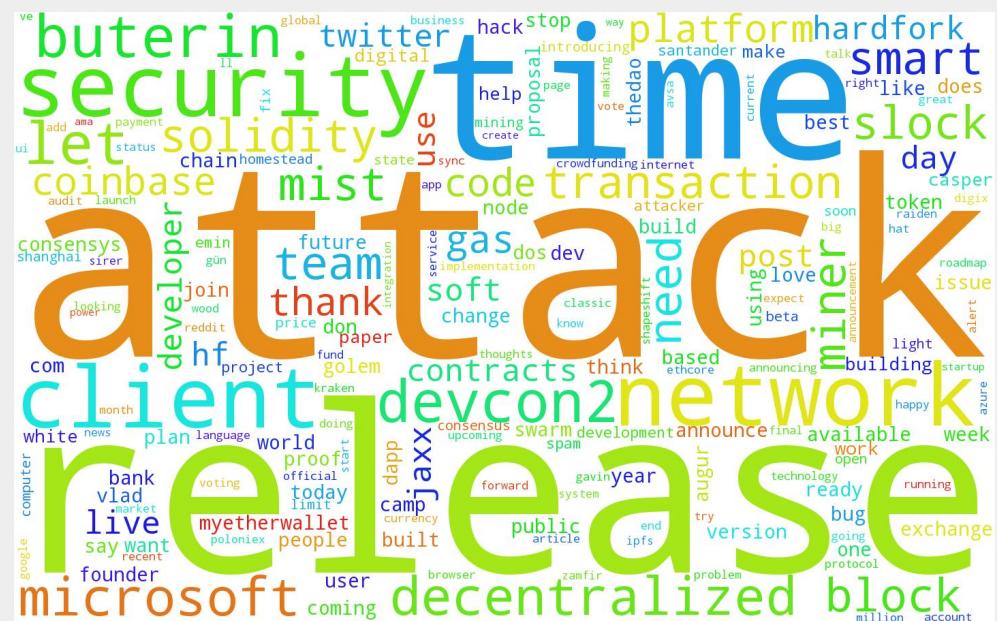


# Count of Posts per Day of the Month



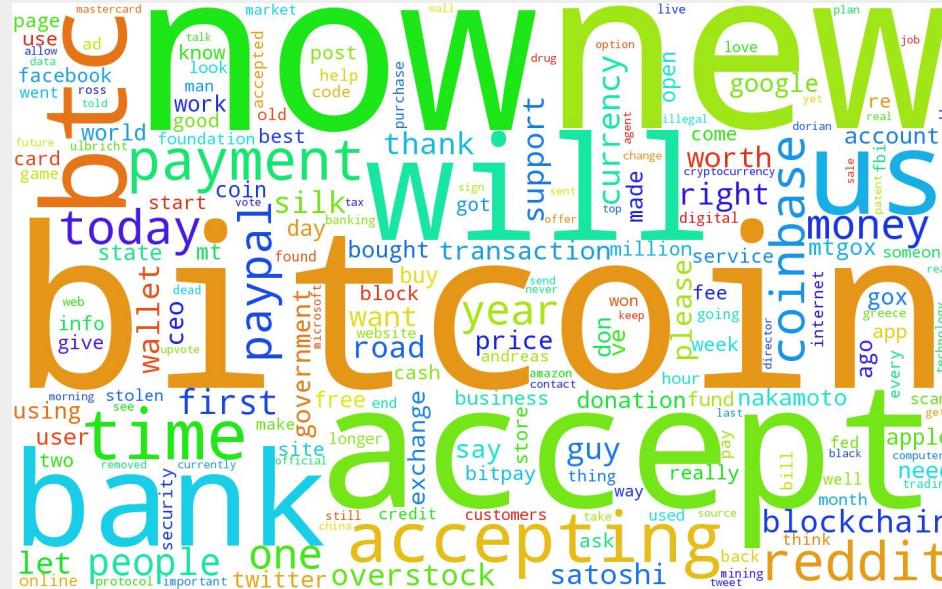
# Word Clouds - Ethereum

	word	count
2085	ethereum	387
2586	fork	98
2794	eth	78
2013	dao	76
511	blockchain	74
194	new	71
2308	1	62
953	hard	59
2241	100	42
2766	0	42
2269	geth	41
2132	update	38
1997	just	36
528	4	35
1378	vitalik	35
573	blog	33
2191	t	31
2448	bitcoin	31
302	community	28
694	contract	27



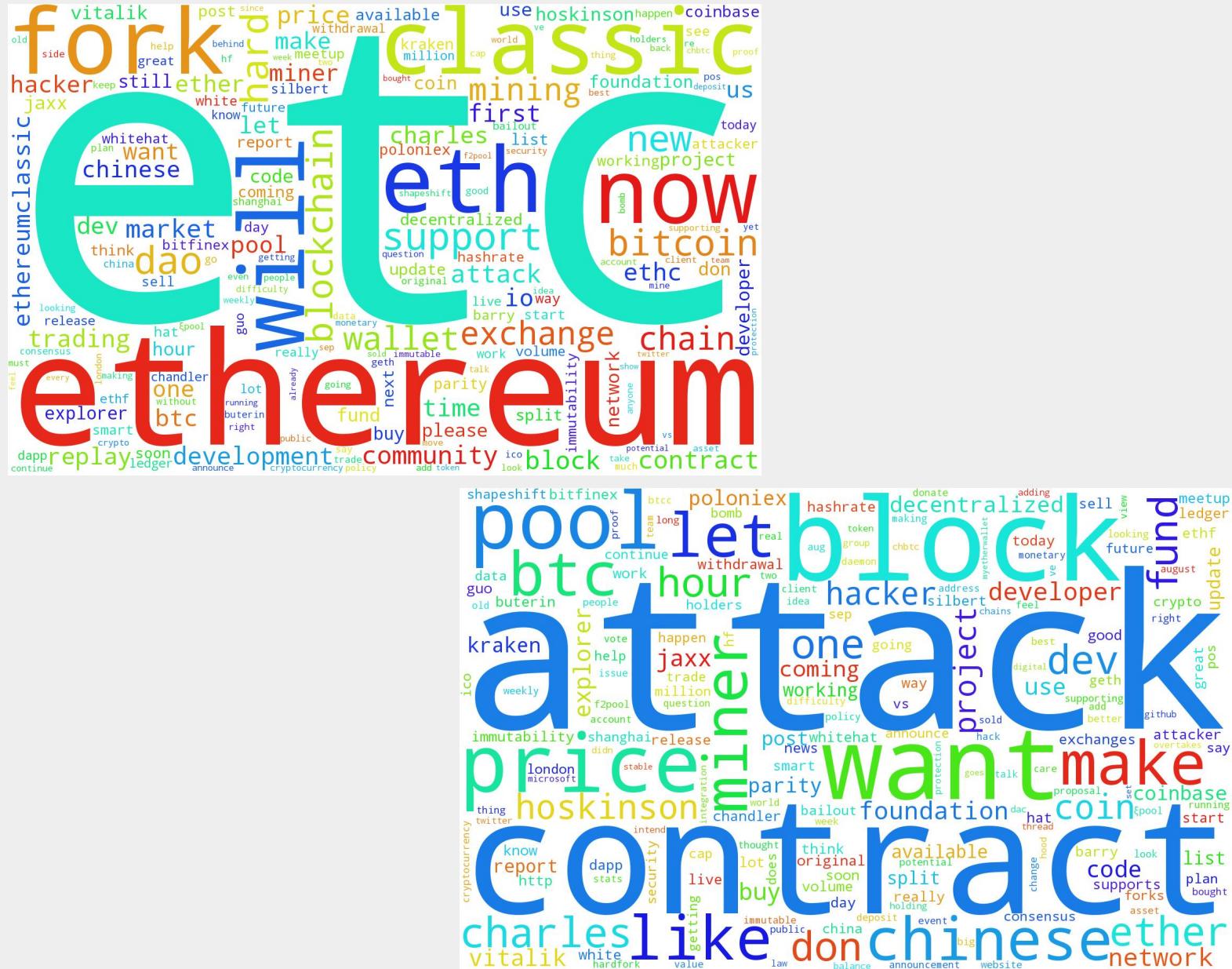
# Word Clouds - Bitcoin

	word	count
2884	bitcoin	565
2348	just	61
175	bitcoins	55
2577	t	53
224	new	40
52	r	37
2302	btc	35
2391	accepting	34
3130	coinbase	31
2786	000	31
3356	money	31
1203	today	31
1170	reddit	31
1619	time	30
140	paypal	30
2898	one	29
303	people	29
1921	bank	28
1317	com	27
1952	first	27



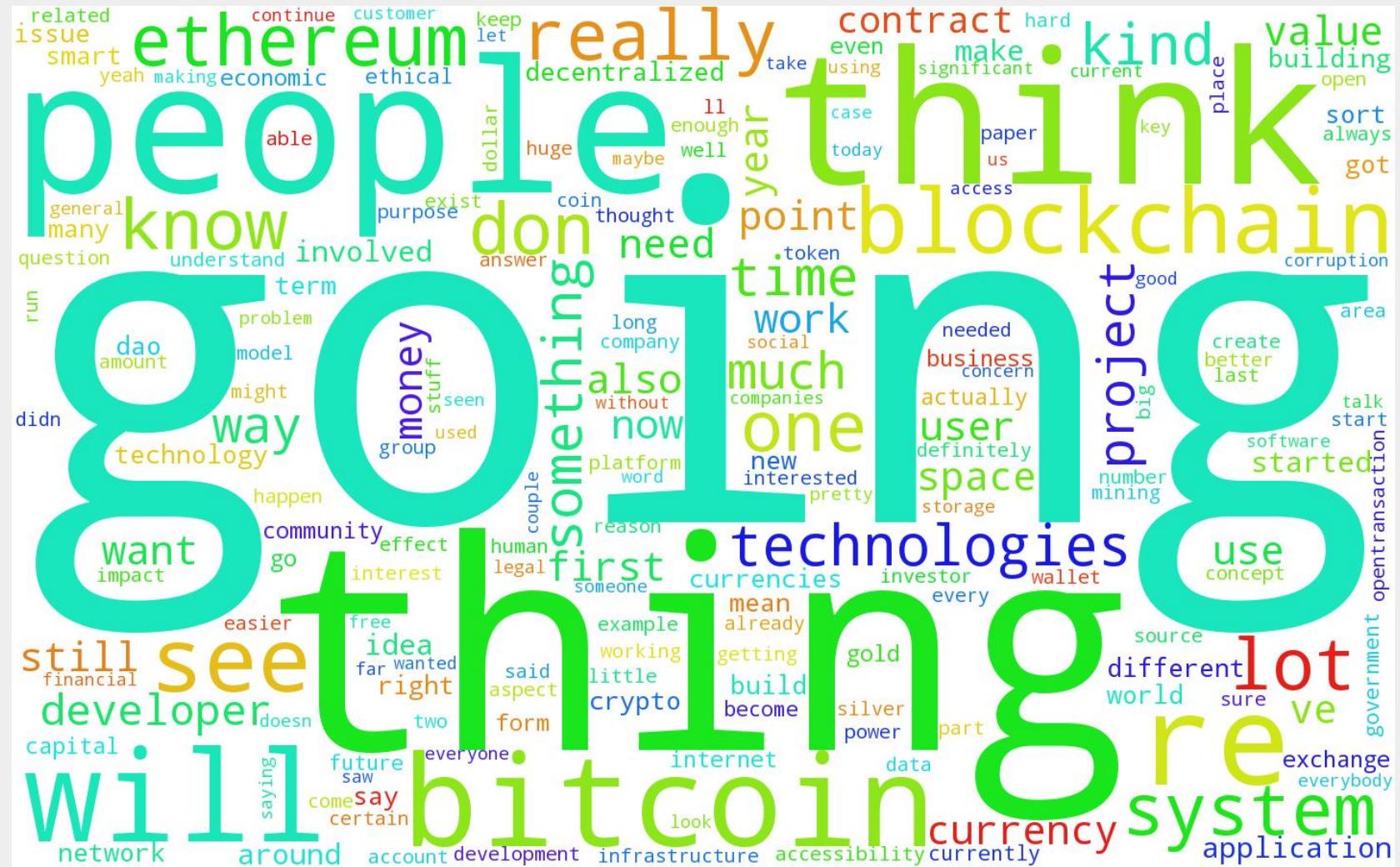
# Word Clouds – Ethereum Classic

	word	count
2118	ethereum	345
1726	classic	240
2508	eth	122
377	fork	66
1805	dao	54
1349	support	49
860	hard	47
464	blockchain	39
2189	bitcoin	36
2059	1	32
1320	wallet	32
160	new	31
1787	just	31
235	mining	30
1957	t	28
269	community	28
119	chain	27
980	com	25
1510	development	25
955	market	25

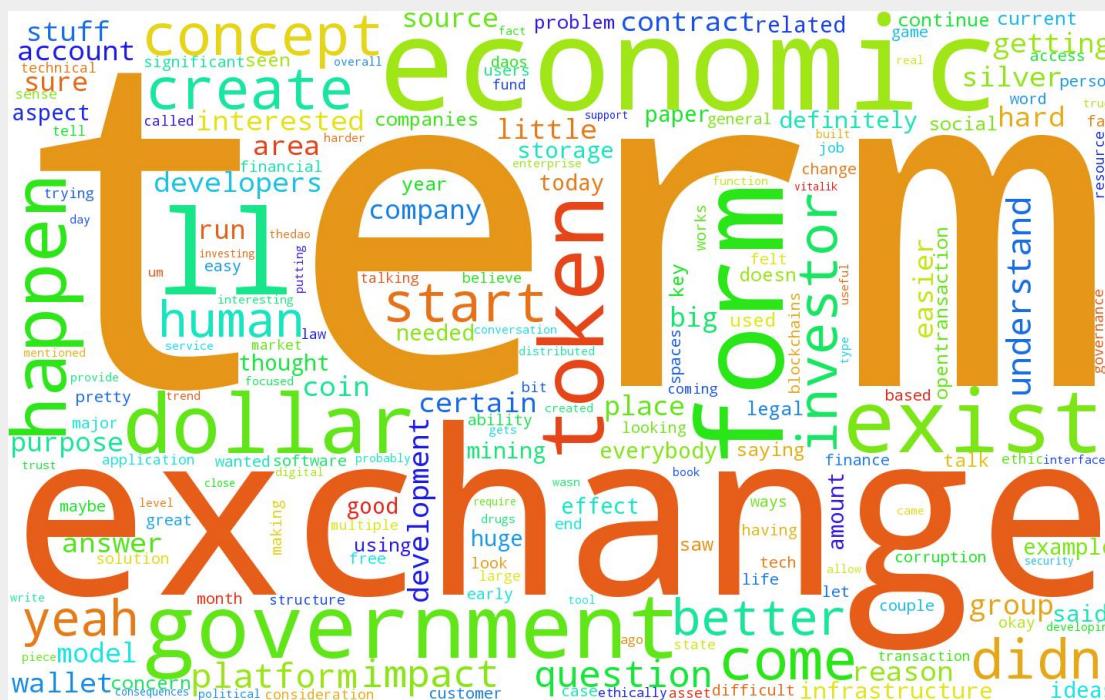
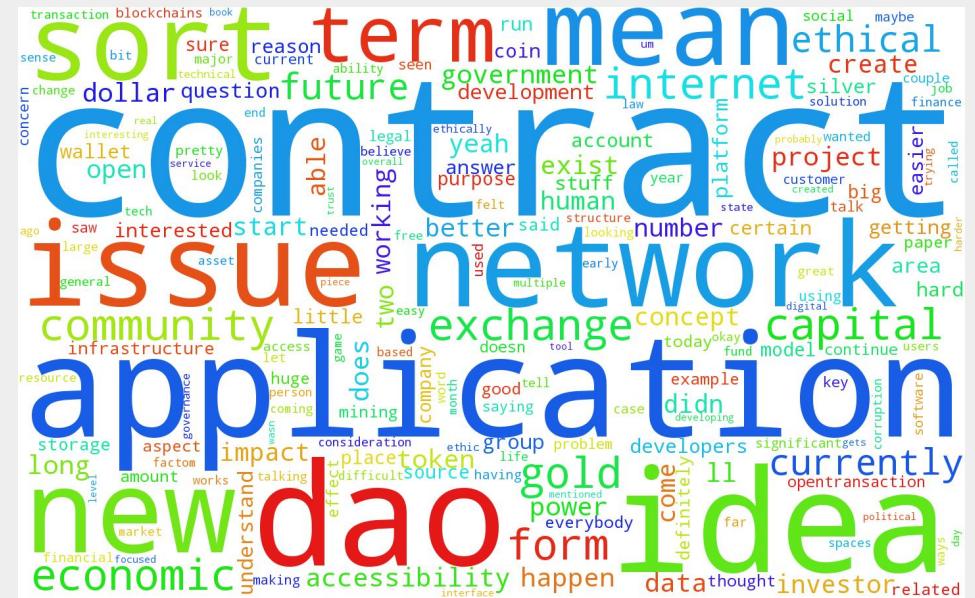


# Word Clouds – Interviews & Conversations

	word	count
2304	going	133
2914	people	118
1721	think	115
1913	it's	103
780	like	94
2117	bitcoin	91
136	things	74
320	ethereum	73
269	just	71
89	blockchain	70
45	i'm	68
1737	lot	63
873	don't	63
1957	really	57
2255	know	55
1688	one	53
2850	thing	52
317	technologies	52
2612	time	47
2647	kind	47
1635	system	40
2107	value	39
868	money	39
3027	currency	39
2649	way	38



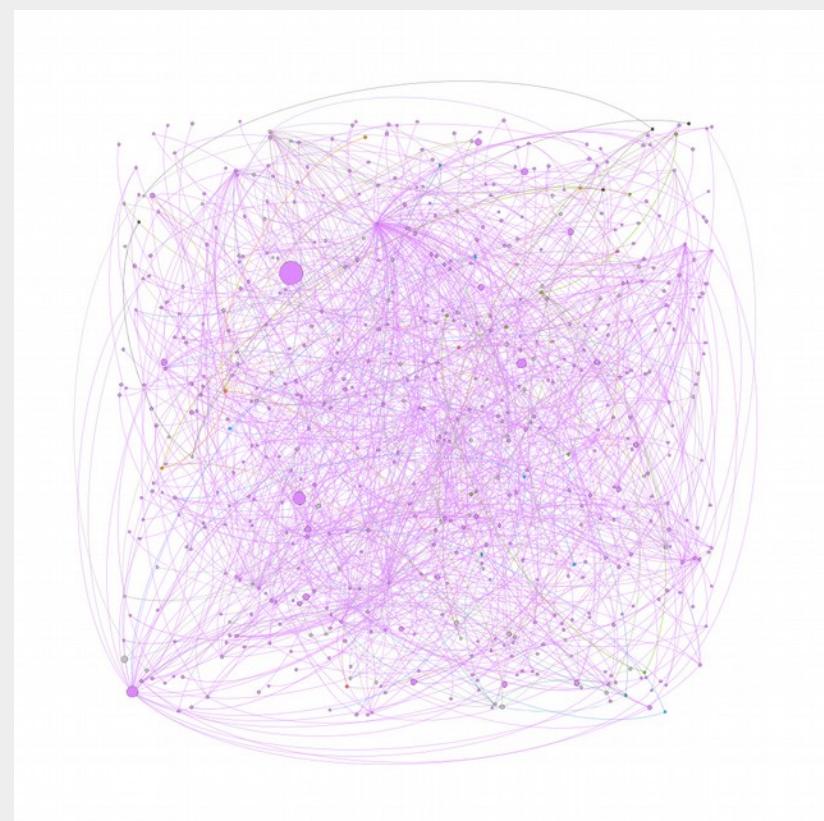
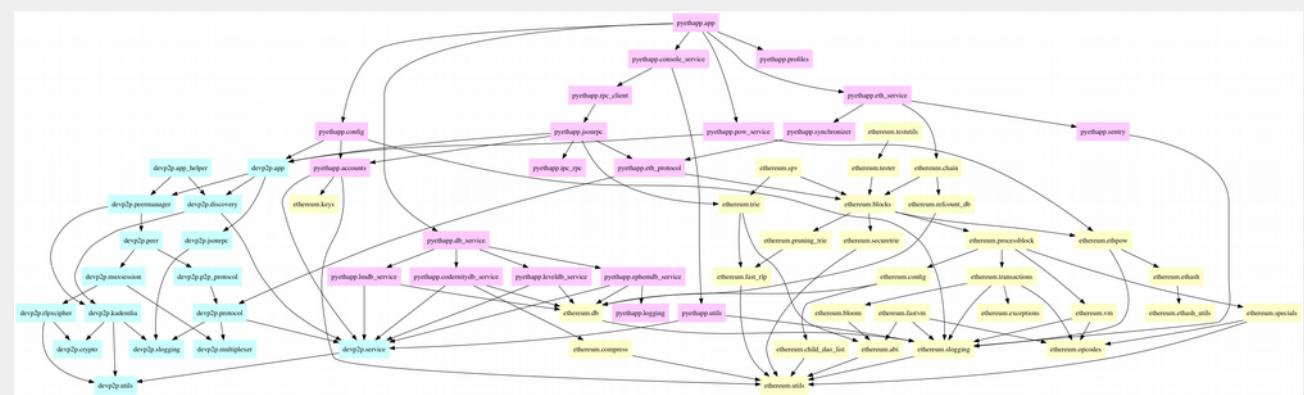
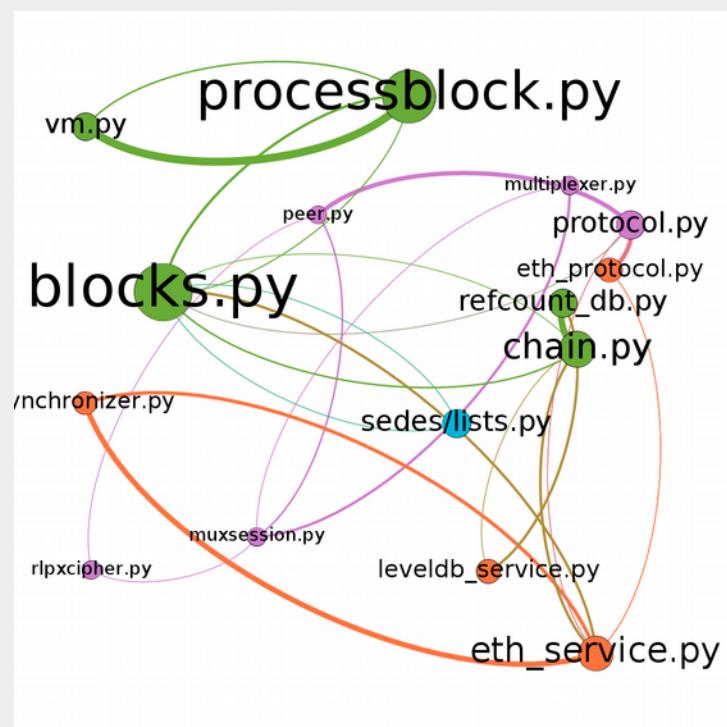
# Word Clouds – Interviews & Conversations



# Ethereum and Code-walkthrough

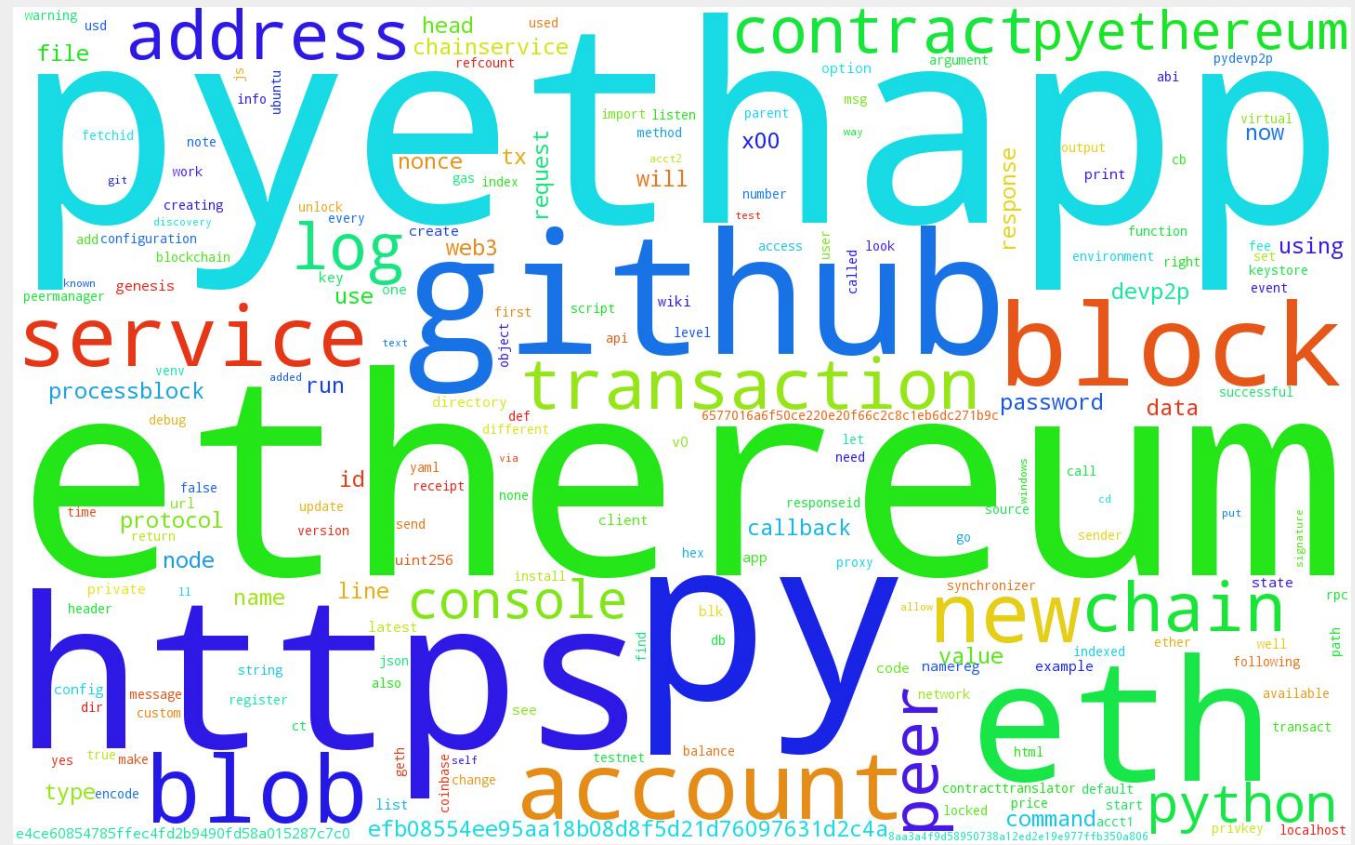
- Ethereum Wallet and Browser
- Experience with Pyethapp
  - Pyethereum Stack
    - Pyethapp, Pyethereum, Pydevp2p, Pyrlp
  - Installation and setup
  - Code Walk-through
  - Compare Docstring and Documentation
    - To Reddit Content
    - To Interviews/Open Conversations

# Code Diagrams



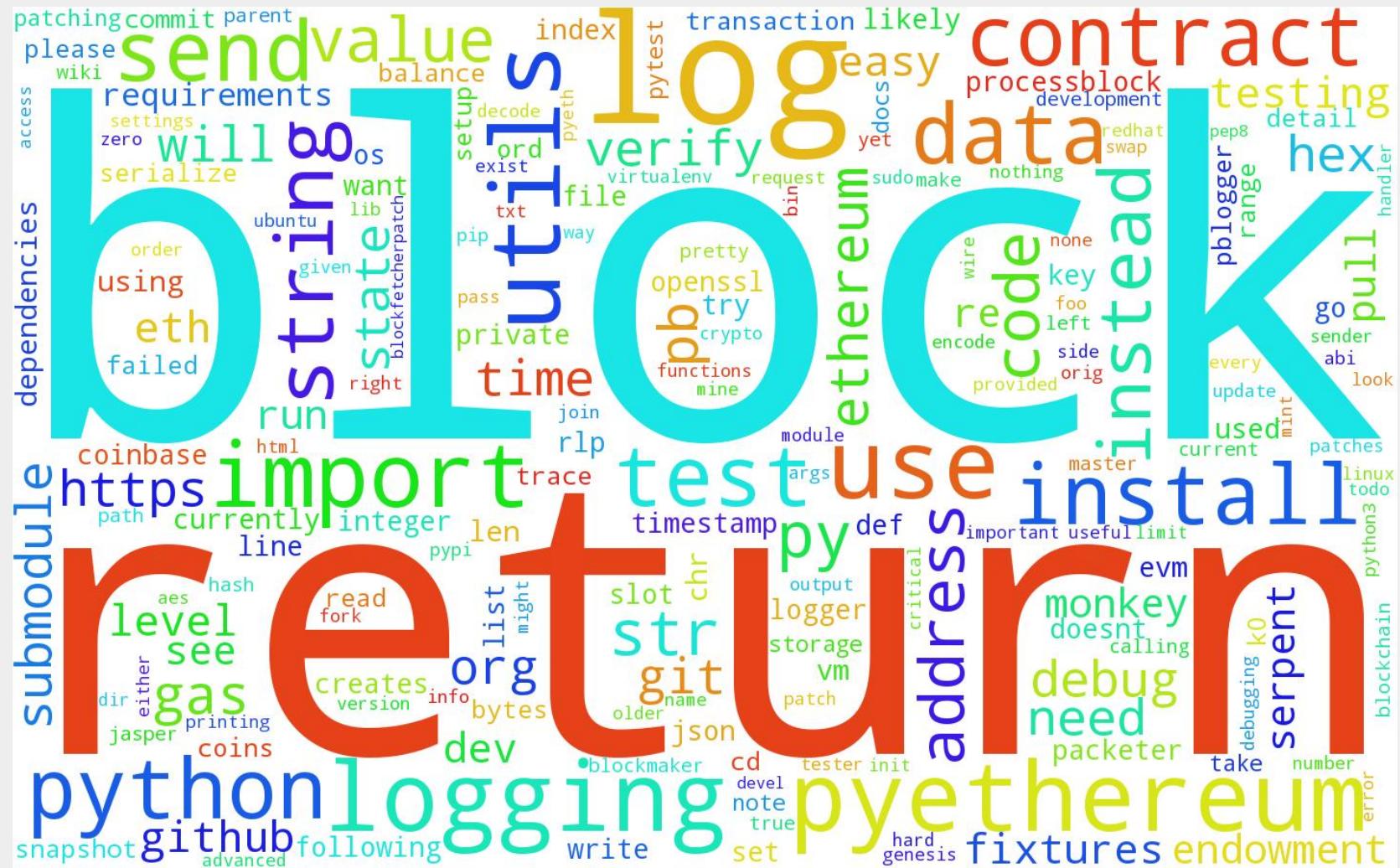
# Word Clouds – Pyethapp Wiki

	word	count
287	ethereum	246
814	pyethapp	191
794	py	182
240	https	125
913	com	121
1217	github	117
75	eth	113
1130	blob	91
86	block	77
1	account	68
986	new	63
670	address	61
374	chain	60
185	service	53
639	pyethereum	49
1117	python	48
142	console	48
1471	efb08554ee95aa18b08d8f5d21d76097631d2c4a	47
1356	type	43
631	log	42
73	tx	40
777	peer	40
1069	transaction	40
1156	use	39
1026	0	37



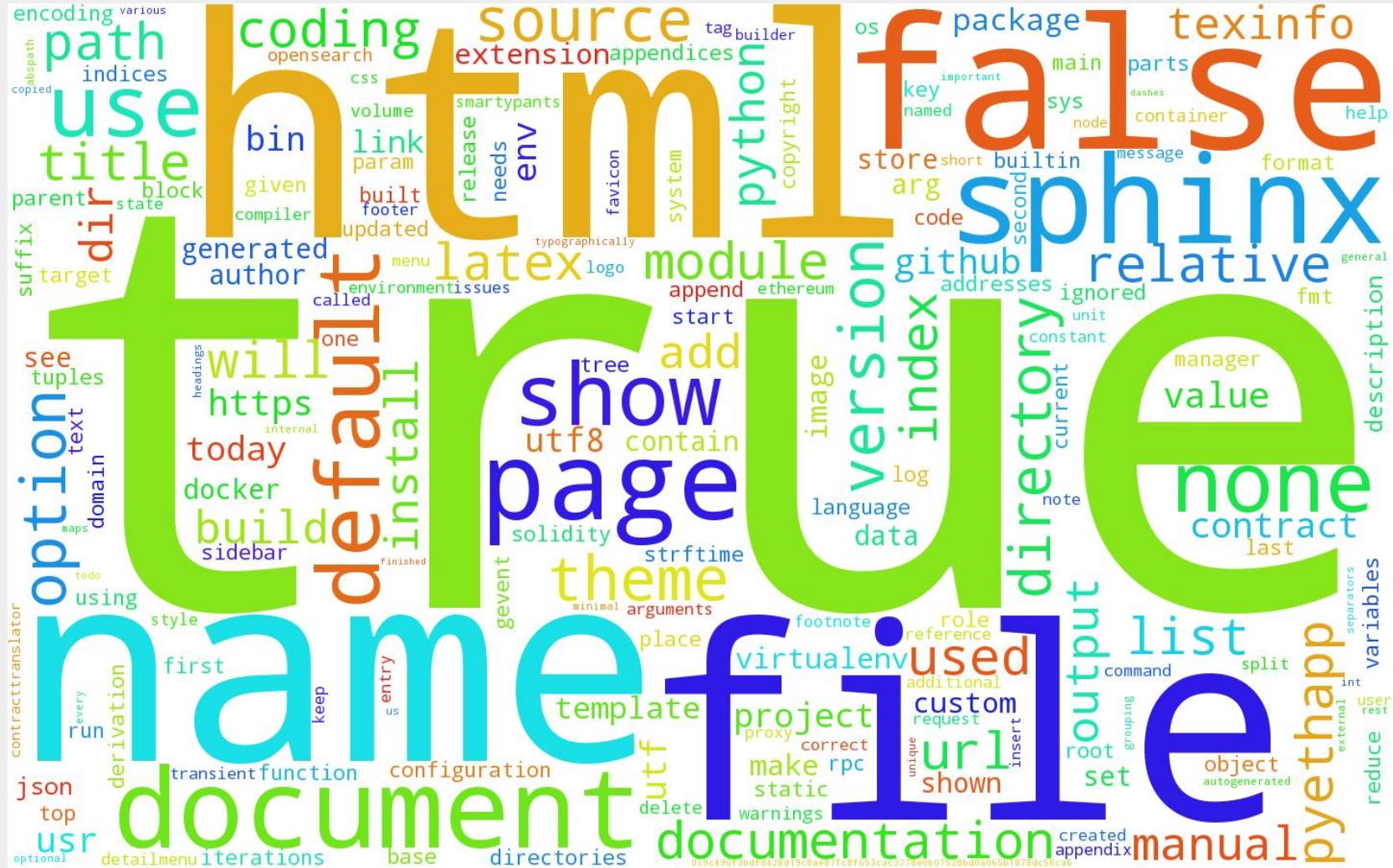
# Word Clouds – Pyethereum Wiki

	word	count
82	block	20
212	pyethereum	15
190	log	14
292	use	14
86	utils	12
451	logging	12
98	import	11
387	contract	10
112	data	9
511	install	9
422	instead	8
262	address	8
71	returns	8
257	python	8
269	py	8
180	return	8
485	gas	7
52	f	7
80	send	7
517	str	7
499	code	7
324	ethereum	7
403	1	6
355	debug	6
278	https	6



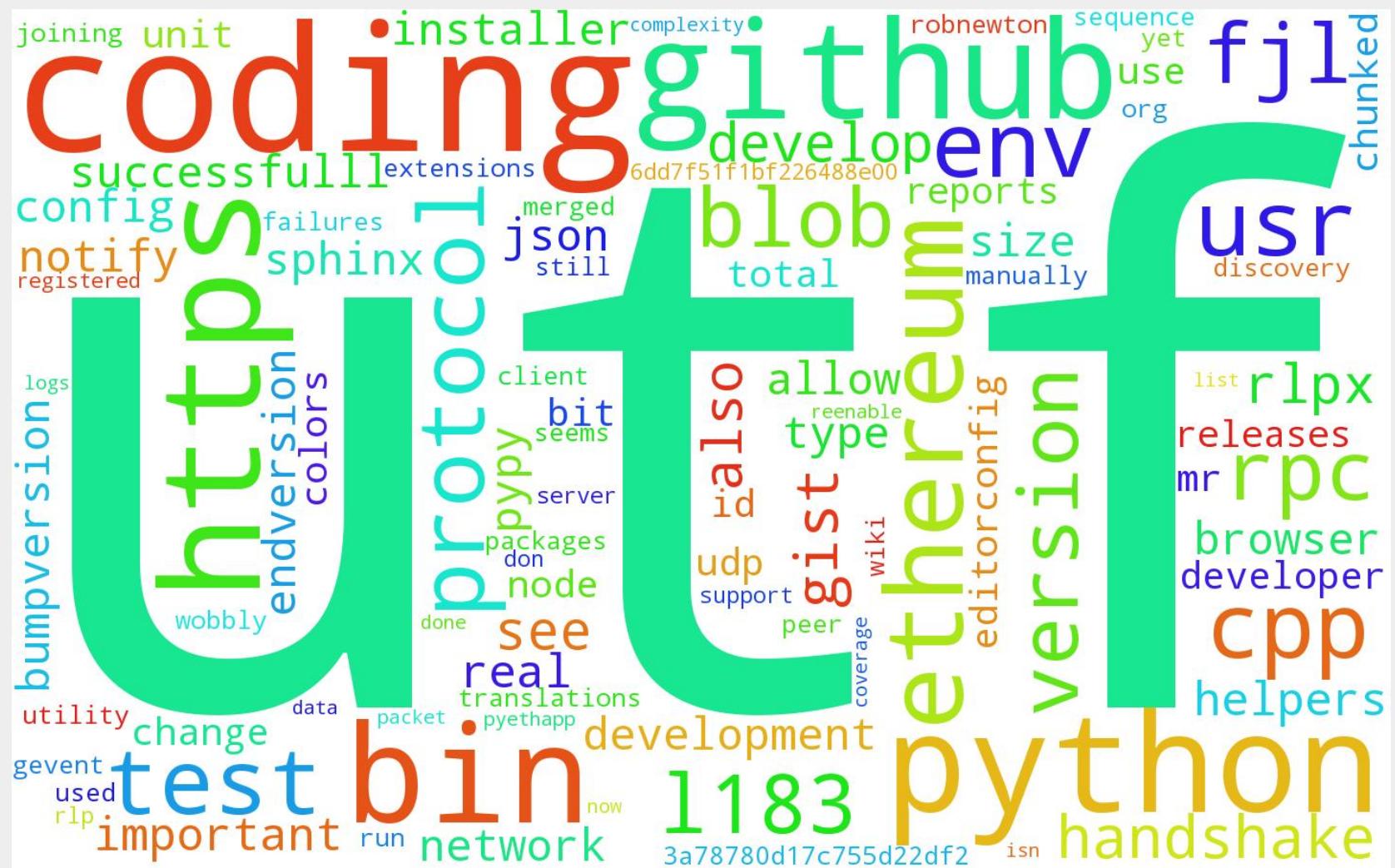
# Word Clouds – Pyethapp Docstring

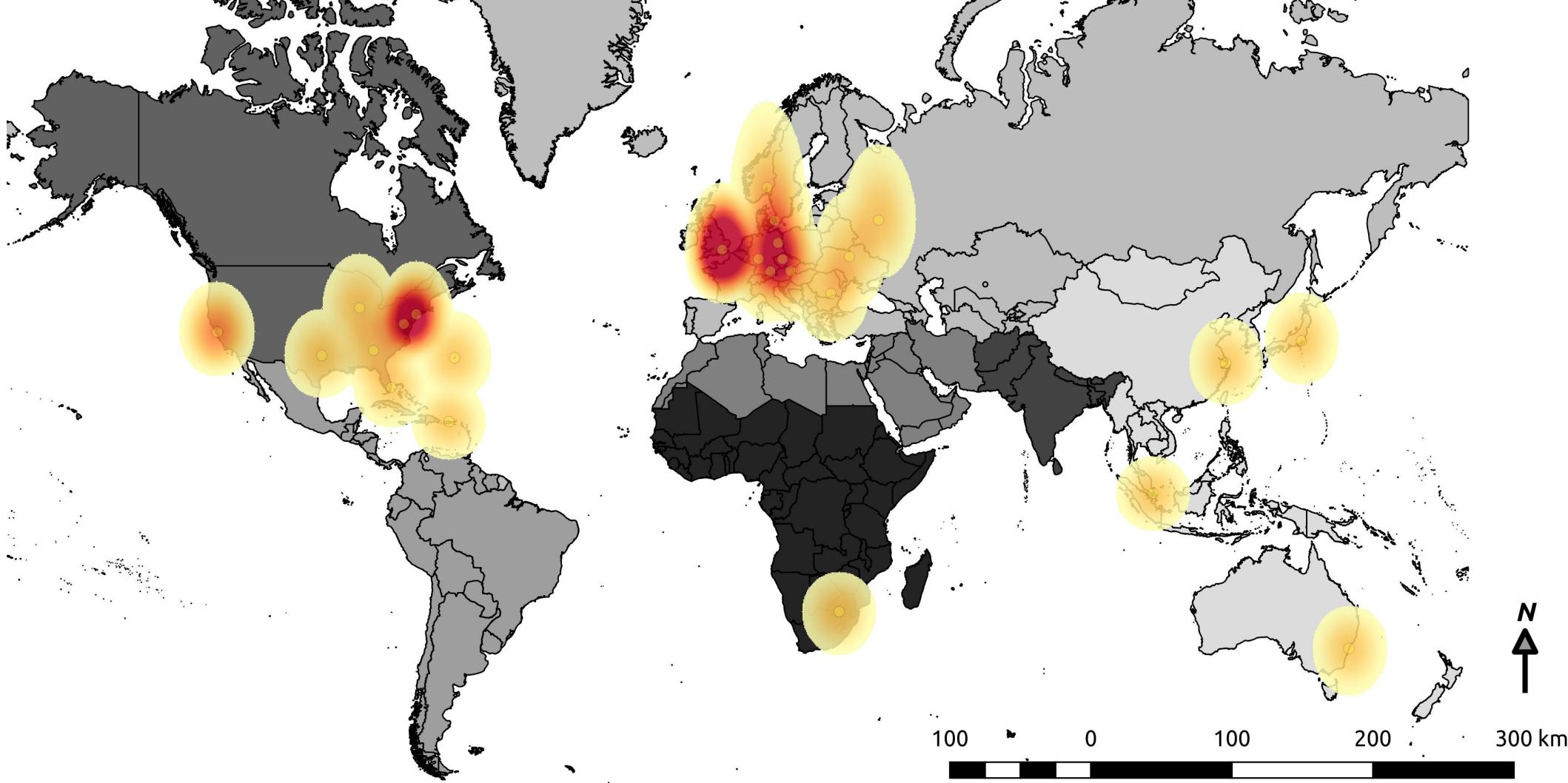
	word	count
38	html	27
225	true	27
526	file	16
418	false	13
192	sphinx	13
320	use	11
140	default	10
241	coding	9
433	pyethapp	9
67	directory	9
24	version	9
152	source	9
250	module	8
472	index	8
146	files	8
233	options	8
489	used	8
325	list	8
102	documentation	8
401	latex	8
360	output	7
90	title	7
427	names	7
277	relative	7
4	theme	7



# Word Clouds – Pydevp2p Docstring

	word	count
86	coding	7
76	utf	7
52	8	7
2	com	6
15	python	6
97	github	6
13	https	6
94	usr	5
66	ethereum	5
78	cpp	5
85	bin	5
95	env	4
67	test	4
103	protocol	3
38	gist	2
79	protocols	2
99	handshake	2
56	rpx	2
104	t	2
17	version	2
60	fjl	2
7	rpc	2
65	develop	2
4	blob	2
87	l183	2





## 2017 Blockchain Events

This map shows the locations as listed in the January 16th, 2017 article "These are the world's best blockchain conferences and expos to attend in 2017."

The regions are colored by regions as designated by the World Bank. The density of events ranges from lower numbers of events in light yellow to high density in red.

Created by: Joe Blankenship  
Data Used: Andrew Meola/Business Insider  
(<http://www.businessinsider.com/blockchain-conferences-2017-1>);  
Natural Earth Country data

● 2017 Blockchain Events	World Bank Regions
Density of Blockchain Events	
■ Low Density	Antarctica
■	East Asia & Pacific
■	Europe & Central Asia
■	Latin America & Caribbean
■	Middle East & North Africa
■	North America
■	South Asia
■	Sub-Saharan Africa
■ High Density	