fundstrat

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IOTA : Becoming an IoT standard could drive market adoption

IOTA could see $700B+ of activity on network by 2030s if adopted as standard

PROJECT RESEARCH

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IOTA is an alternative Distributed Ledger Technology (DLT), which uses "The Tangle", a Directed Acyclic Graph or DAG, to implement fast, feeless and secure decentralized transaction confirmations, primarily for the Internet of Things (IoT). ***Should IOTA become adopted as standard***, it could lead to $700B+ of IoT economic activity on the IOTA network, which translates to a 20% share of an eventual $3.3 trillion DLT market (slide 37). This could result in an eventual token market cap of ~$280 billion (slide 39), with a likely range of $200-400 billion, based on our simulation (slides 40 to 45).

- **IOTA's Tangle is a scalable, feeless DLT architecture well suited for IoT usage (slide 14).** A feeless and permissionless network, if successful, allows for secure, encrypted, low-value and no-value transactions at scale. This enables use cases like micropayments where cars can be paid for sharing road conditions with each other.
- **IoT adoption presents $700B+ opportunity for decentralized networks like IOTA's Tangle.** After years of anticipation, a growing labor shortage and falling semiconductor and communication costs (slide 30) combine to make large-scale IoT deployments viable and necessary. The IOTA Foundation intends to gain a meaningful share of these new deployments through its ecosystem of startups, corporate, government and academic partnerships.
- **IOTA is leading IoT standard adoption which is critical for its success.** Interoperability is key to realizing at least 40% of the estimated $11 trillion value of the IoT economy, per McKinsey (slide 31). This leads to the need for industry standards around data communication, encryption and security. IOTA is in the process of establishing standards and contributing its open source code to a contributor network in partnership with the standards body Object Management Group (adoption process expected to be completed by late 2020, slide 22). We believe the winning standard will have dominant market share.
- **Existing partnerships show utility for IOTA technology.** IOTA partners include STMicroelectronics (slide 58), Jaguar Land Rover (slide 61), EDAG Group (slide 62) and Smart City program CityXChange (slide 60). Each helps establish Proofs of Concept and testbeds, setting the stage for adoption. In addition, IOTA analysis and citations in academic publications have been growing as well (slide 28), a positive in our view.
- **Token price of $0.27 on 9/25 implies market is skeptical about IOTA's future success:** If IOTA became the standard, our equation of exchange approach implies a $200-400 billion market cap. The current price implies an annual discount rate of ~45% (slide 39) to get to that future market cap.
- **What could go wrong?** Emergence of a competing standard or scaling challenges would result in meaningful downside risk to token price. Crypto is a volatile asset class with the potential for any token to eventually prove worthless.

Bottom line: IOTA aims to become the standard protocol for machine to machine data and value transfer. The architecture of the Tangle, combined with Coordicide (slide 53), promises to be able to deliver speed and security in a fully decentralized environment. Should IOTA succeed, it could gain a dominant share of its core market, although the risk profile of IOTA and most Cryptos is high.

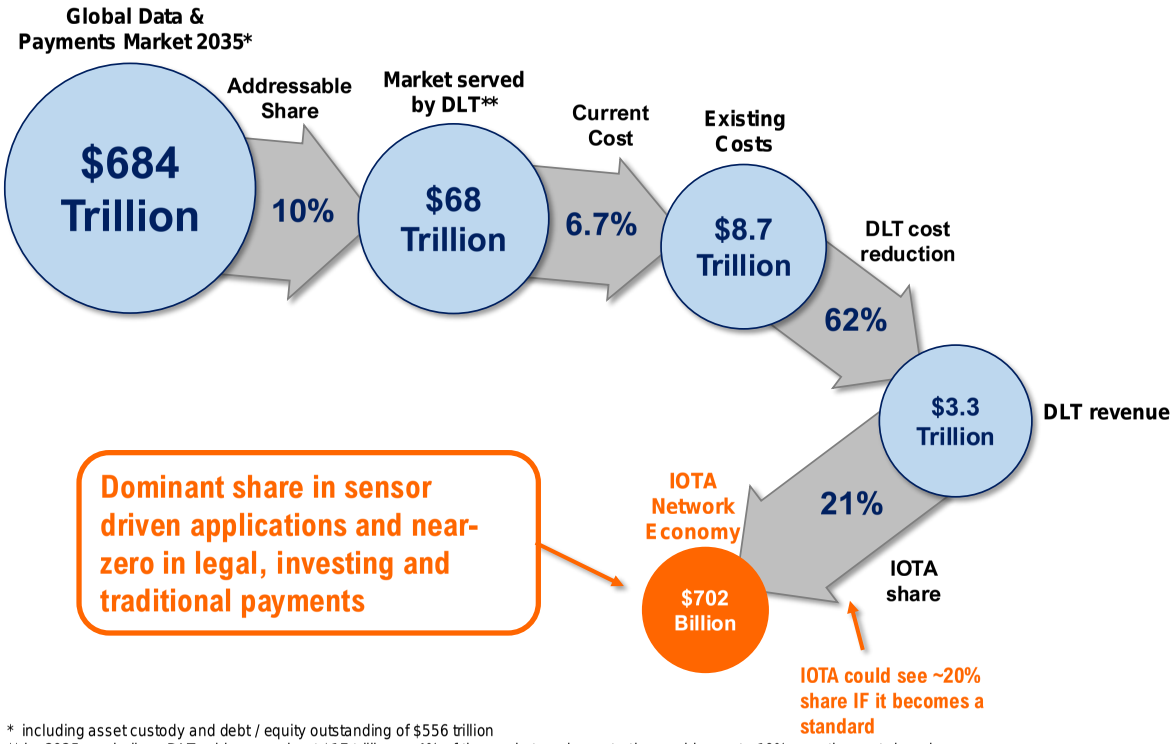
IOTA TL;DR

- A feeless distributed ledger
- Specialization in IoT
- IoT standards setting; evidence of success by late 2020
- Labor shortage and falling costs boosting IoT adoption
- $200-400 billion estimated market cap, if successful
- **Risks:** Failure to become a standard, technical challenges and crypto volatility

For Reg AC certification and other important disclosures see Slide 71

EXECUTIVE SUMMARY: IOTA network economy could grow to $700 billion by 2035

IoT should accelerate into 2025 and begin to stabilize by 2030-35. See slide 68 for market value build.



* including asset custody and debt / equity outstanding of $556 trillion
** by 2025, we believe DLT addresses about $17 trillion or 4% of the market, and penetration could grow to 10% over the next decade
Source: Fundstrat

EXECUTIVE SUMMARY: IOTA successful adoption a 5-10 yr process with 2020 milestones to watch

- **We believe 2020 will deliver crucial evidence of adoption – specific milestones to watch for include:**
  - Whether IOTA gets adopted as a standard (Late 2020)
  - Number, breadth and success of proofs of concept in key verticals
  - Degree of integration of IOTA technology into semiconductors and devices
- **Over the next 4-5 years, reference solutions, deployments and design wins hitting the market are key evidence of successful traction**

Standards adoption in 2020 is crucial to success

2020	2021-25	2026-30	2031-35	2035+
Standards Adopted Accelerating Proofs of Concept Semiconductor Design-in	Reference designs Complete solutions Broad deployments Design wins come to market	Interoperability key value driver Penetration up Wide recognition in academia	Stable baseline growth Growth in machine IOTA wallets	Growth driven by new markets and uses

Source: Fundstrat

Key IOTA Tangle features make it a fit for value and data transfer use cases

Highly scalable

- Each transaction validates two prior transactions, in parallel, so the network throughput improves with scale – as more transactions are generated, the faster a transaction gets confirmed

Zero-fee transactions

- IOTA instituted zero fees to enable high volume of low or no value transactions; cost to participate is compute power to validate two transactions for each transaction the participant generates

Secure data transfer

- Secure, encrypted channels for data including Masked Authenticated Messaging (MAM) using open source code, connecting to the IOTA Tangle through standards such as HTTP, MQTT and BLE

Quantum immune

- IOTA uses a ternary radix for cryptography, improving quantum immunity

Security, scalability and zero transaction fees make IOTA a good fit for the high transaction volumes generated by IoT value and broader data transfer use cases

Source: IOTA

EXECUTIVE SUMMARY: IOTA DLT features – scalable, secure, standardized

Scalability	• IOTA can process large numbers of transactions per second • Currently able to deliver tens of thousands of transactions per second – necessary to enable core IoT applications
Decentralization	• No single point of failure – Coordicide will help achieve full decentralization • High reliability / availability and low downtime of network • Resilient to a variety of attack vectors – particularly after Coordicide
Security	• Post coordicide: reputation-based weighting of nodes – Reputation earned over time reduces incentive for malicious actors to squander it on fraudulent transactions • Transaction security and immutability allows trust of data sent over public networks • Security currently aided by the Coordinator node operated by the IOTA Foundation
Cost	• IOTA views users' operating cost as a roadblock to adoption at scale • Feeless structures enable massive transaction volumes by reducing friction costs • Real-time settlement without fees necessary to enable micropayments
Governance	• Open source software code being contributed to a contributor network • Standards setting underway with Object Management Group • Standardized open-sourcing lowers legal barriers for business entities to contribute to the code base and participate in the network • Work with regulators and policy makers ensure compliance

IOTA currently uses Coordinator node to trade off security vs decentralization

Source: Fundstrat, IOTA

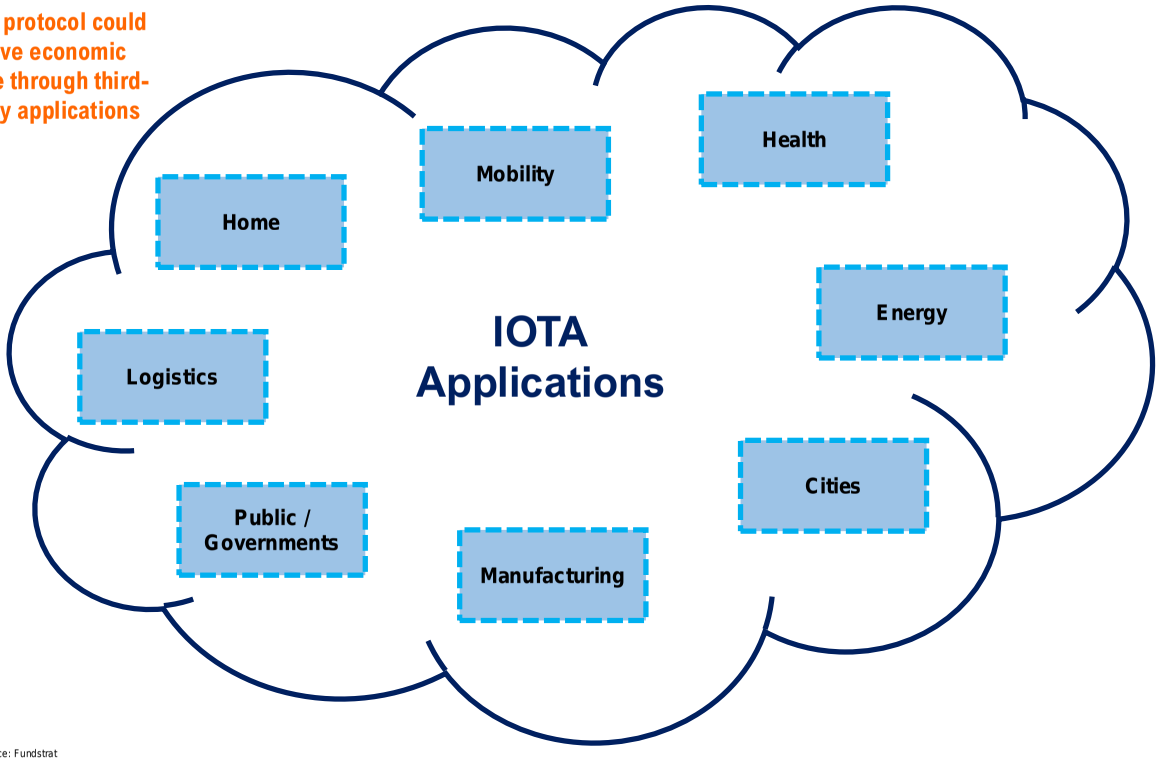
EXECUTIVE SUMMARY: IOTA's platform is high speed, interoperable, and enterprise ready… but demand is unproven

	Technical	Market
Pros	• The Tangle Directed Acyclic Graph allows high theoretical transaction speeds at scale • Scales at the first layer, no Proof of Work wasted effort • Efficient computational load enables no IOTA fees and low validation cost • Transaction confirmations are fast at scale • IOTA Reference Implementation is in Java, along with Python, C++, Rust and Go • Open source code	• Targeting secular growth markets in IoT and machine to machine communication • Standards setting work with OMG is key to success • Partnerships with high-visibility businesses like Jaguar Land Rover, Bosch and Volkswagen • Built into STM32 microcontroller, allowing for easy hardware implementation and design in R&D labs • Strong startup ecosystem with examples in AI, connected automotive and smart city applications • Public-private partnerships with cities like Austin, Taipei and the European Commission-led multi-city CityXchange initiative
Cons	• Unproven technology: Current transaction volume is still low and mainly in testing • Current live TPS is about 7 – a tiny fraction of theoretical capacity • Confirmation takes longer because of lack of subsequent transaction volume to validate a given transaction • Currently centralized with the Coordinator node, which is a single point of failure	• Enterprise demand for distributed ledger technology unknown: no deployments at scale yet • Current partnerships are proof of concepts and testbeds • Focus on narrow (albeit rapidly growing) applications • Until IOTA is adopted as a standard, companies may hesitate to adopt • Token value depends on holders' view of long-term adoption – current activity levels remain quite low • Extended design-win to deployment cycles result in long lead times to mass adoption

EXECUTIVE SUMMARY: IOTA's core offering spans 8 services or markets

The potential for a multi-trillion-dollar opportunity in DLT, IOTA's platform, standards initiatives and scalable technology (in theory), all point to the potential long term value of IOTA's token.

IOTA protocol could drive economic value through third-party applications



Source: Fundstrat

EXECUTIVE SUMMARY: If IOTA succeeds, network could be worth ~$280B

- We estimate the future value based on:
  a. $700B+ of economic activity on IOTA, if successful
  b. An annual velocity of MIOTA of 2.5x
  c. 2.8 billion MIOTAs outstanding
  d. Implied future value would be $280 billion or $101 per MIOTA using MV=PQ
- This implies a 45% discount rate to get from the current $0.27 price to the future value. This compares with standard venture discount rates for Series A/B funding (slide 70)
- **Clearly, future value is conditional on adoption and on the assumed velocity of MIOTA**

Figure: IOTA Valuation
$ billion except per unit

		2035
Annual IOTA Ecosystem, US $B	a	**$702**
Total Miota in circulation, billions	b	2.78
Velocity of Miota, p.a.	c	2.5
Implied 2035 Market Cap, US $B	d = a / c	**$281**
Implied 2035 Price of Miota, US $	e = d / b	$100.98
Current price, US $		$0.27
Implied discount rate		**44.8%**

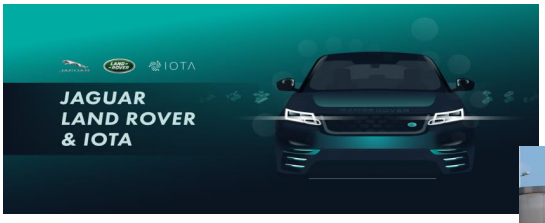
Market is discounting success at 45% per annum

Source: Fundstrat
Note: MV = PQ implies Price of MIOTA = $463 B economy / 1.5 Velocity / 2.8B MIOTA tokens in existence

EXECUTIVE SUMMARY: Jaguar Land Rover partnership example of IOTA's powerful auto roadmap

- **Testbed deployment in the Ireland R&D facility focused on proofs of concept**
- **Primarily a software solution layered onto the infotainment system, which enables cheap and easy retrofitting into late-model vehicles eventually**
- **If successful, IOTA is seeking to encourage auto OEM partners to develop global technology standards to enable new ways of paying for existing services (tolls, parking) as well as allow new applications including peer-to-peer parking and charging services**
- **In addition, data sharing could alert authorities and other vehicles about road and traffic conditions, and allow dynamic dispatch of emergency responders and maintenance crews to the right sites**

IOTA partners and their developments can be leveraged
Jaguar Land Rover's IOTA-enabled Car Smart Wallet



Vehicles are now connected and acts as data aggregators. Car Wallet enables data stream monetisation and opens many possible use cases which will transform vehicles in Autonomous Economic Agents:

- Pay seamlessly for charging, tolls, parking
- Monitor road conditions and report to road authorities
- Replace toll gates with Satellite/GPS location based realtime payments
- ....

Testing tolling and road condition reporting

https://blog.IOTA.org/earn-as-you-drive-with-jaguar-land-rover-and-IOTA-3c744d8c0cba

Source: Fundstrat, IOTA

EXECUTIVE SUMMARY: Downside risks to thesis

- Adoption of Crypto and Distributed Ledger technologies could lag expectations
- IOTA technology deployment may prove slower or less robust than plan
- IOTA may fail to sign on major partners in the key automotive and Smart City space, or design wins in semiconductor or device manufacturers may lag, affecting the adoption curve and market share for IOTA
- Fragmentation among competing DLT solutions could slow adoption until clear and/or interoperable standards emerge. This could lead to an undershoot on network utilization and thus our network value estimate
- Decentralized apps on the network could fail to deliver compelling end-use applications that drive adoption
- Coordicide fails to deliver on its promise of decentralization, or proves difficult to implement in practice
- Crypto is a volatile asset class with the potential for the category or any particular token or project to eventually prove worthless and is not suitable for every investor
- The opinions expressed in this report are the beliefs of the author at the time of publication. Fundstrat does not commit to update this report and is not responsible for any independent investment decisions made by a reader, based on this and / or any other sources of information

Source: Fundstrat

EXECUTIVE SUMMARY: Upside potential to thesis

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- IoT adoption could accelerate faster than expected as equipment and services costs continue to fall
- Improvements in AI and other enabling technologies help expand autonomous decision making by machines. Transaction volume surprises to the upside both in terms of number of transacting parties and frequency of transactions
- DLT adoption accelerates as projects and solutions achieve critical mass in multiple use cases
- IOTA believes the Tangle technology is more scalable than Blockchain technology. Should this be proven correct IOTA may lead DLT adoption and gain larger share than our Base Case
- Micropayments are a key use case that leverage native capabilities of the IOTA platform.
- Accelerating adoption of DLT for machine to machine micropayments could benefit IOTA and expand market share and addressable market sooner than we model
- As IOTA achieves critical milestones on the technology, governance and end market adoption, the risks to the project would diminish, reducing the discount rate and boosting valuation – However, that would affect future valuation and potential returns to holders of the token, rather than reflect fair value today

Source: Fundstrat

Introduction to IOTA

Introduction to IOTA

IOTA is a public Distributed Ledger Technology (DLT) project which supports decentralized applications (dApps), primarily for machine to machine data and value transfer. IOTA is working with standards body OMG to be the open-source industry standard, which would give it a dominant market share of Industrial, Health, Infrastructure and Smart City sensor-based applications

IOTA raised $500,000 with a fully-distributed token issuance of ~2.8 billion MIOTA tokens in 2015. The IOTA Foundation is a German non-profit with 100+ employees in 23 countries and $40M+ in funding from community donations and government grants

Key features:

- High transaction speeds and no network fees at scale, using a Directed Acyclic Graph topology called "The Tangle"
- Adoption as a standard would allow interoperability across applications and devices
- Partnerships with government and industry bodies as well as corporates such as Jaguar Land Rover, Bosch and Volkswagen
- Robust startup economy of vendors creating unique solutions that use IOTA as the communication and payment layer
- Coordicide software update will make the ledger fully decentralized, eliminating IOTA's centralized "Coordinator" node
- Earned reputation of nodes will give security to the network – nodes will gain reputation and weight through extended validation history

Value Proposition:

- Feeless and permissionless allows for large number of secure, encrypted, low-value and no-value transactions
- This enables micropayments for data sharing between users (e.g. cars can share road conditions with each other and city managers)
- Key use cases are in field applications: logistics and smart routing, predictive infrastructure management, in-field maintenance…
- Enhance asset tracking and on-site service applications, managing parts, inventory and personnel

If IOTA succeeds, the economy could grow to $700 billion in value by 2035, with much of the growth beginning in 2021, driven by standards adoption, partnerships and design wins, which are the key milestones we are monitoring for signs of traction

Catalyst: Milestones in the OMG standards creation process over the next 12 months could demonstrate traction

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IOTA's Tangle could make machines smarter if demand for IoT takes off…

- **Connected bins can tell the garbage collectors when they are full**
- **Garbage trucks are efficiently routed past bins that don't need emptying**
- **City managers or end customers are notified when the garbage is collected**
- **With an IOTA wallet, the bin can autonomously pay the truck per pickup and settle each transaction quickly**
- **Crypto-enabled car wallets can also securely pay by microtransaction to be rerouted to avoid congestion behind the truck**

Figure: IOTA wallet enabled garbage bins can request and pay for garbage collection autonomously
Theoretical example; IOTA ecosystem startup Lidbot is working on such a solution

Source: Fundstrat

IOTA could deliver fee-less transactions at scale...and is permissionless

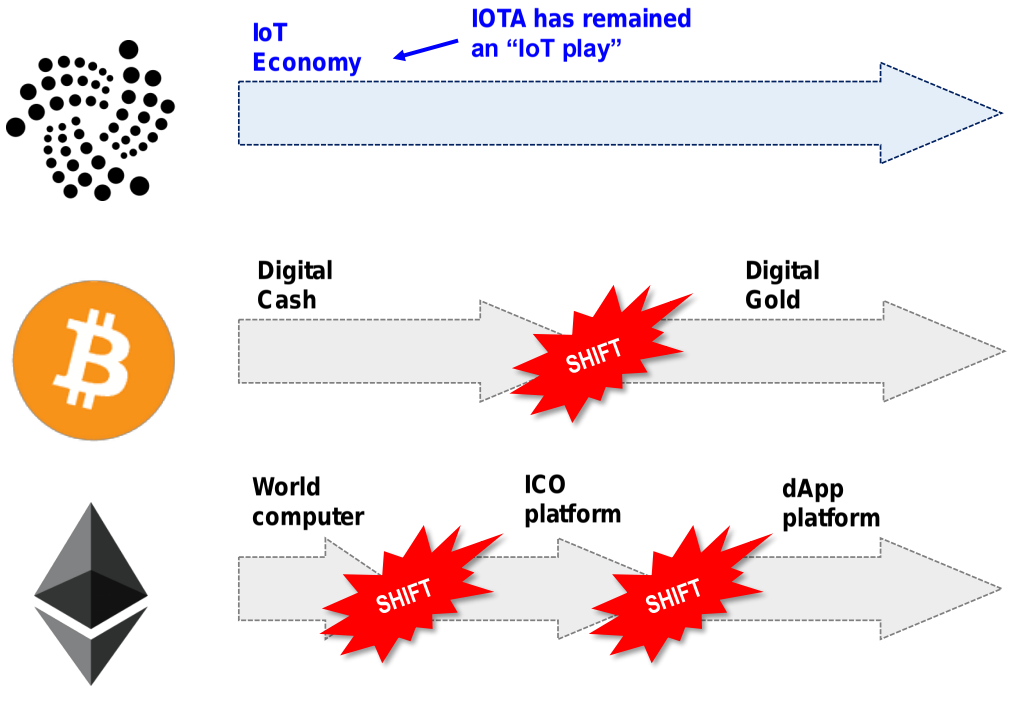
Fee-less transaction at scale, without permissioned nodes

	IOTA	Bitcoin	Ethereum	Ripple	Bitcoin Cash	Litecoin
Use case	dApp platform (IoT)	Payments / SOV	dApp platform	Payments	Payments	Payments
Consensus algorithm base	Adaptive POW (Tangle)	Proof of work	Proof of work	Proof of authority	Proof of work	Proof of work
No transaction fees	●			◑		
Fixed supply	●	●		●	●	●
Permissionless nodes	●	●	●		●	●
Block rewards		●	●		●	●
Scalability	●	◔	◔	●	◑	◑

Source: Fundstrat

IOTA's use case has been consistently centered around IoT

While the use case narrative for BTC and ETH has shifted since their launch, IOTA's has not which points to consistency in the team's go-to-market strategy.



Source: Fundstrat

Value creation in crypto is centered around frictionless value transfer

Many of the opportunities for value creation in the economy by crypto projects stem from cryptocurrencies' ability to offer users frictionless (or near-frictionless) transfer of value (the transfer of 1s and 0s which represent value in digital economy).

IOTA has multiple vectors for value creation

Category	Description	IOTA	Bitcoin	Ethereum	Ripple	Bitcoin Cash	Litecoin
Enterprise cost savings	Financing and tracking	●			●	●	
Payments	Reduced payment fees	●	◔	◑	●	●	●
Store of value	Trusted asset storage and retrieval	◔	●	◑		◔	◔
Enable open sourced funding	Funding platform or token open to public		●	●		●	●
New business models	New payment streams	●	◑	●		◑	◑

Source: Fundstrat

Project Overview

IOTA DLT features – scalable, secure, standardized

Scalability	• IOTA can process large numbers of transactions per second • Currently able to deliver tens of thousands of transactions per second – necessary to enable core IoT applications
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Source: Fundstrat, IOTA

IOTA successful adoption a 5-10 yr process with 2020 milestones to watch

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  - Number, breadth and success of proofs of concept in key verticals
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- **Over the next 4-5 years, reference solutions, deployments and design wins hitting the market are key evidence of successful traction**

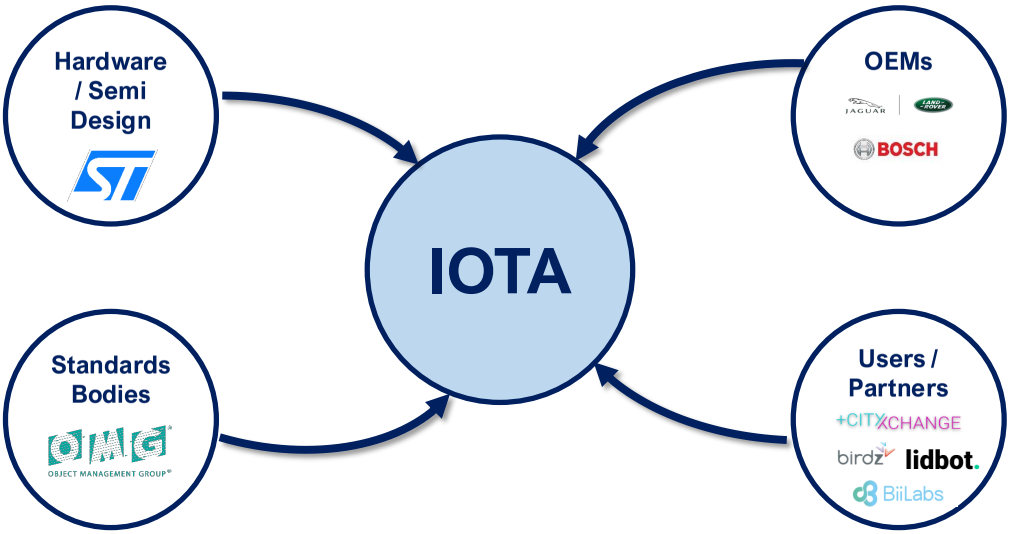
Standards adoption in 2020 is crucial to success

2020	2021-25	2026-30	2031-35	2035+
Standards Adopted Accelerating Proofs of Concept Semiconductor Design-in	Reference designs Complete solutions Broad deployments Design wins come to market	Interoperability key value driver Penetration up	Stable baseline growth Growth in machine IOTA wallets	Growth driven by new markets and uses

Source: Fundstrat

Go-to-market crucial for adoption: Direct partnerships + independent ecosystem startups

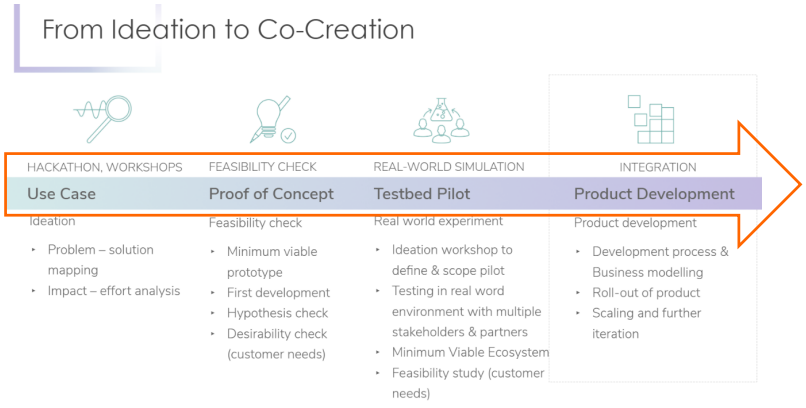
- **For IOTA to succeed, it needs to become a standard**
- In addition, it must achieve buy-in from hardware and semi manufacturers, Industrial OEMs, as well as find adoption in the end user verticals
- Success is likely to be binary: One player likely gains a dominant share, with perhaps 1-2 additional players surviving.



Source: Fundstrat

IOTA has a strong ecosystem that fosters open source innovation

- **Develop use cases with industry, governments and startups**
- **Work with partners to develop and test Proofs of Concept**
- **Product Development phase where corporates and startups create solutions**
- **Commit larger resources towards the development of Testbed / Pilots**



Source: IOTA

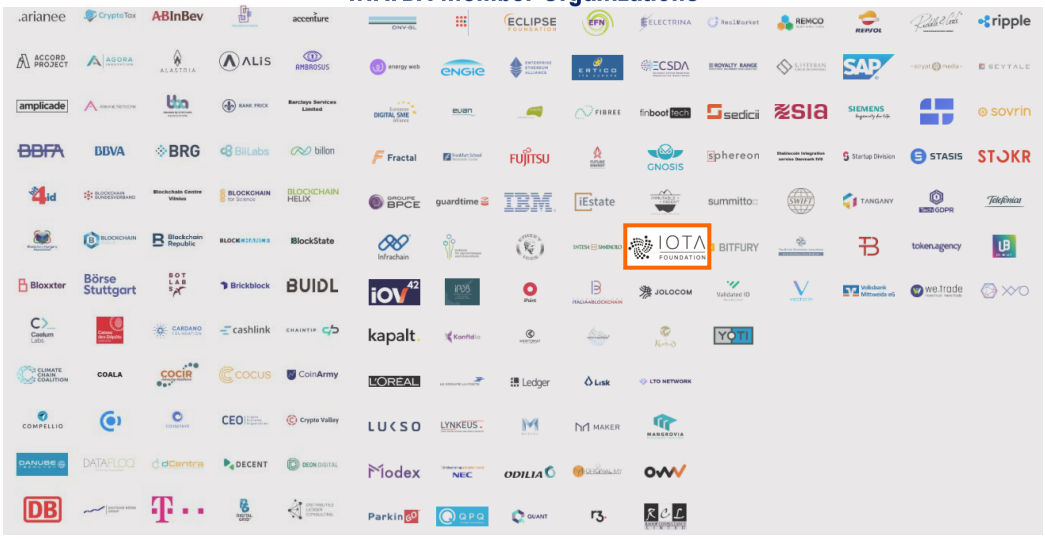
Regulatory Leadership: IOTA chairs INATBA, an European Commission supported body with 150+ members

INATBA

INATBA, the International Association for Trusted Blockchain Applications, offers developers and users of DLT a global forum to interact with regulators and policy makers and bring blockchain technology to the next stage.

- The INATBA (International Association of Trusted Blockchain Applications) initiative is led by the European Commission and allows for dialog with regulators and policy making bodies
- There are over 150 member organizations ranging from giants like IBM, Accenture and ABInBev to blockchain startups
- **The IOTA Foundation is a founding member and chairs the board of INATBA**

INATBA Member Organizations



Source: IOTA, inatba.org

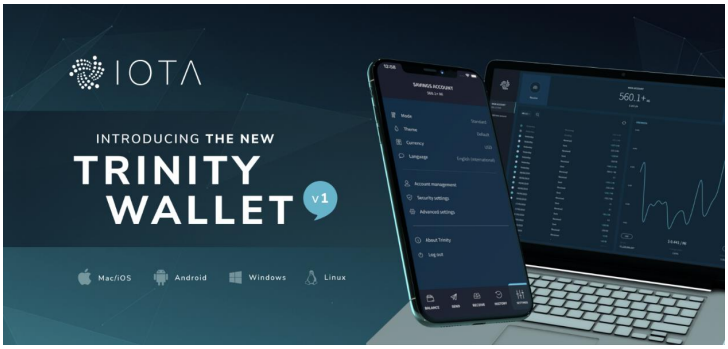
IOTA's Trinity Wallet key to broad token distribution

Fully functioning open-source IOTA Wallet, available on iOS, Android and Desktop

Security audited by 3 independent security companies – SixGen, Accessec and Cyber Security Lab

With over 190,000 downloads and over $2 Billion in transfers, it has momentum

The next version of Trinity will include Identity and Data Management, positioning Trinity as a Smart City platform for residents



Source: trinity.IOTA.org

Broad token adoption is a key to network growth

- Looking at non-speculative addresses (addresses where IOTA is not held on an exchange, but in a personal wallet), IOTA has 368,686 Wallets holding tokens.
- Exchange wallets could account for twice as many individual holders.
- An increase of 10% in the last 4 months, accelerating the rate of adoption considerably.
- The majority of growth has come from small investors looking to hold between 100 Mi - 1 Gi, 1 Gi - 10 Gi and 10 Gi - 100 Gi.
- A redistribution of 2.35% of the total supply (valued at $23.5 Million) has occurred from the 3 largest addresses ranges to the 4 mid addresses ranges in the last 4 months
- Non-speculative addresses are expected to increase dramatically as more use-cases involving the IOTA Token are introduced

Figure: Majority of adoption growth has been from small investors
as of July 23, 2019

Balance	Addresses	% Addresses (Total)	Sum IOTA	Value USD	% IOTA (Total)
1 i - 10 i	19214	5.17 %	41.6 Ki	0.012 USD	0.00 %
10 i - 100 i	13519	3.64 %	534.55 Ki	0.156 USD	0.00 %
100 i - 1 Ki	19915	5.36 %	7.88 Mi	2.299 USD	0.00 %
1 Ki - 10 Ki	22744	6.12 %	77.2 Mi	22.525 USD	0.00 %
10 Ki - 100 Ki	19193	5.17 %	803.51 Mi	234.448 USD	0.00 %
100 Ki - 1 Mi	10517	2.83 %	4.71 Gi	1,372.916 USD	0.00 %
1 Mi - 10 Mi	29900	8.05 %	142.42 Gi	41,553.809 USD	0.01 %
10 Mi - 100 Mi	63797	17.17 %	2.9 Ti	846,752.321 USD	0.10 %
100 Mi - 1 Gi	100312	27.00 %	38.3 Ti	11,174,099.294 USD	1.38 %
1 Gi - 10 Gi	58882	15.85 %	176.29 Ti	51,436,534.114 USD	6.34 %
10 Gi - 100 Gi	12250	3.30 %	274.33 Ti	80,043,057.046 USD	9.87 %
100 Gi - 1 Ti	946	0.25 %	258.23 Ti	75,346,032.997 USD	9.29 %
1 Ti - 10 Ti	266	0.07 %	777.04 Ti	226,724,543.57 USD	27.96 %
10 Ti - 100 Ti	37	0.01 %	876.15 Ti	255,642,558.337 USD	31.52 %
100 Ti - 1 Pi	2	0.00 %	376.14 Ti	109,750,968.821 USD	13.53 %

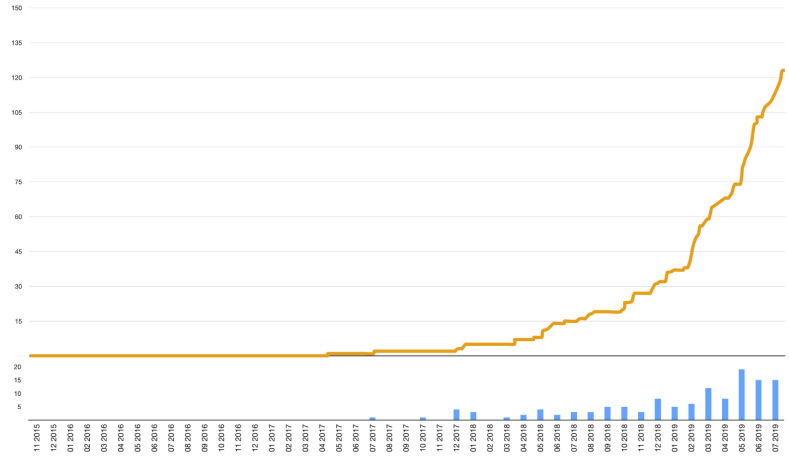
Small / Mid-size holders are key to broadening adoption

Source: thetangle.org

IOTA-related academic research is on the rise

- **The IOTA Foundation has been working with academia to further advance its research and ultimately lead to adoption**
- **Since the introduction of the IOTA Tangle, related research is at an all-time high, showing the interest from academia**

Figure: Academic papers analyzing or referencing IOTA
Orange line shows cumulative articles; blue columns are monthly articles



Academic citations a rigorous measure of acceptance

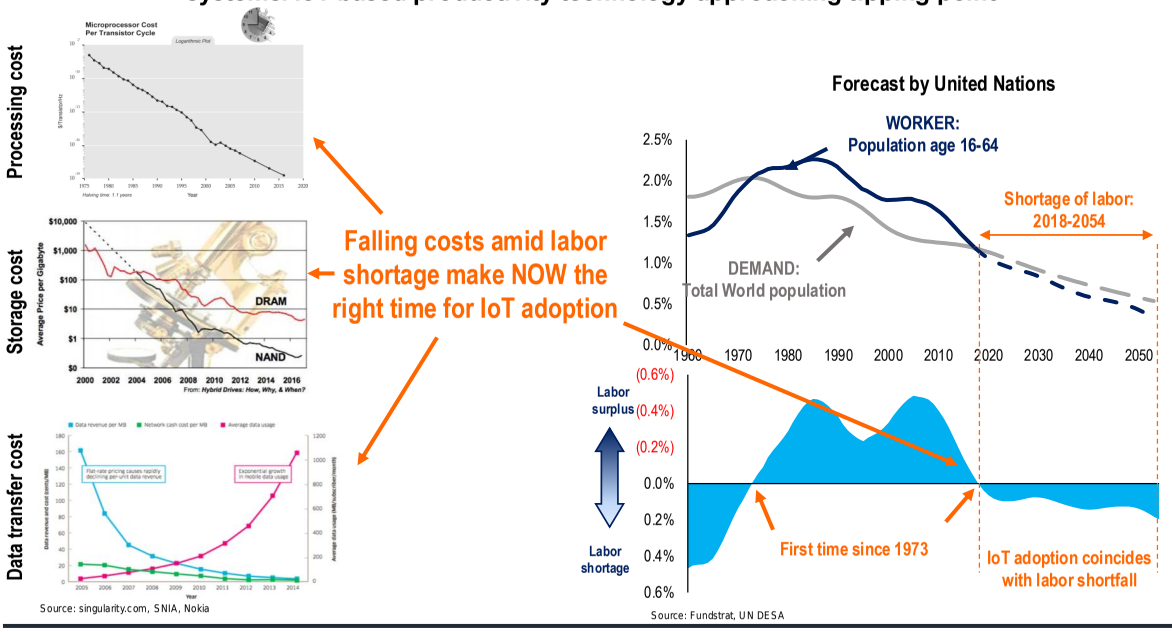
Source: IOTA

IoT Market Potential and Standardization

Introduction | Project Overview | IoT Market Potential and Standardization | Addressable Market & Valuation | Technical Overview | Case Studies | Appendix

Falling semiconductor and data costs enable sensor / IoT to address labor shortage

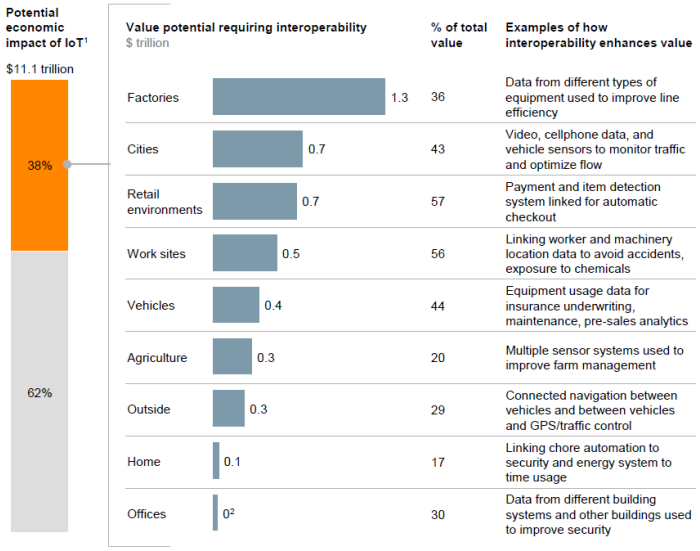
- A growing global labor shortage of 78 million workers by 2028
- Need for productivity gains, many in distributed field applications – supply chain, asset tracking, fleet management, on-site service and parts etc.
- **Falling cost of semiconductors and data and improvements in sensor and control systems: IoT based productivity technology approaching tipping point**



McKinsey believes interoperability drives 40% of IoT impact so standardization is *crucial*...

Interoperability drives economic value

Figure: 40% of IoT value potential requires interoperability = Standards + Security



1 Includes sized applications only; includes consumer surplus.
2 Less than $100 billion.
NOTE: Numbers may not sum due to rounding.

SOURCE: Expert interviews; McKinsey Global Institute analysis

- McKinsey believes IoT could add $11 trillion of value by 2025
- **Nearly 40% of value requires interoperability**
- **Currently, 99% of sensor data is lost before reaching decision makers**
- It cites an example of 30,000 sensors on a single offshore oil rig. Individual equipment manufacturers collect performance data from their own machines. Interoperability would combine sensor data from different machines and systems to provide decision makers with an integrated view of performance.
- A smart city centralized traffic-control system "would need to analyze not only the data from thousands of sensors and traffic cameras on roads, but also feeds from tens of thousands of cars, thousands of parking meters, and hundreds of buses, as well as non-traffic data, such as weather reports. Aggregating and analyzing the data in a timely way—to reverse lanes on a highway to relieve congestion, for instance—requires smooth interaction among all the systems."
- **The development of robust interface standards is the missing link in unlocking the full potential of the IoT data**

IOTA supports key embedded computing & sensor / IoT drivers of Semi growth

- We believe that much of the total silicon wafer growth over the next decade will derive from low power sensor and control type of applications, which aligns with IOTA's area of focus.
- The STMicro strategic objectives shown below are one such example of aligned objectives where IOTA feeds into STMicro's focus areas (Highlighted in the orange box)
- IOTA needs to get designed in to semiconductors, hardware devices, and partnerships such as the one with STMicro, detailed on the following slide, are critical to accelerating adoption – we will be looking for additional semi partnerships as evidence of growing adoption and falling risk

Figure: STMicroelectronics' Strategic Objectives from Investor Day 2019

Semiconductor companies see strategic growth in IoT applications

Source: Fundstrat, STMicroelectronics -https://investors.st.com/static-files/03138996-09ac-46bf-9091-31459f1176df

IOTA is solving the standards question in partnership with OMG

Standards setting is key to unlocking the value potential of IoT, as McKinsey pointed out.

- We spoke with Dr. Richard Soley, Chairman / CEO of the Object Management Group, a leading standards body, and the Executive Director of the Industrial Internet Consortium, leading the adoption of IoT
- He discussed IOTA's work with OMG as well as multiple industry partners to establish a set of communications and data protocol standards – **to solve the interoperability problem McKinsey identified as a roadblock to nearly 40% of the value potential of IoT**
- **IOTA is currently in the process of standardizing its protocol and moving all of its open-source codebase to a vetted contribution framework – which enables security which is critical when transmitting state and control information about infrastructure**
- **This makes it easy for diverse OEMs and enterprises to participate in development and to adopt IOTA technologies for commercial applications**

Standards setting is key to IOTA adoption – and the process is well underway

- As Dr. Soley said, "There have been open source projects that have not succeeded. There have been standards that have not been adopted. **But there has never been an open source project that became a standard, that has not been adopted"**
- With a timeline of roughly 15-18 months before standards adoption and a head start by IOTA, we think 2021 could prove the beginning of a major acceleration in adoption if current standards and open-source work bears fruit

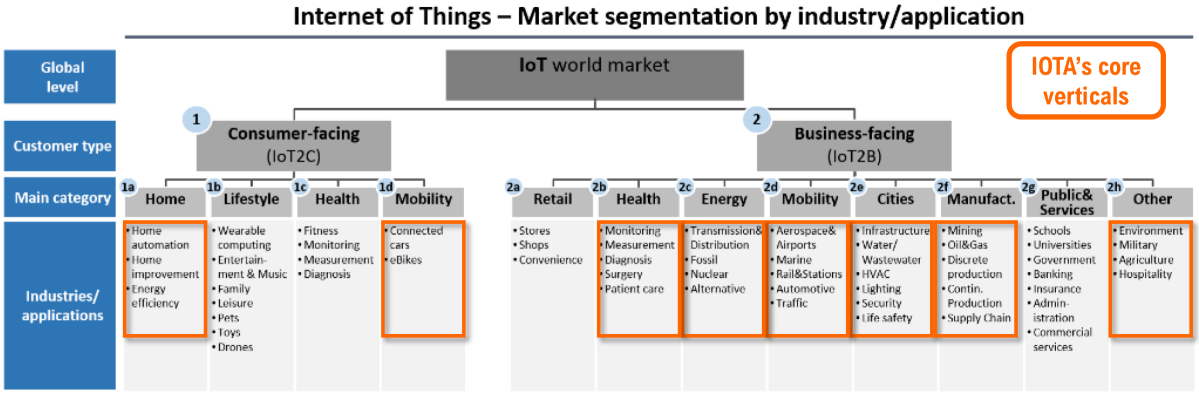
OBJECT MANAGEMENT GROUP ®

IOTA is working with OMG to make the protocol a standard

IOTA could serve multiple consumer and business facing applications

- IoT Analytics breaks up the market into 12 industry / application categories
- Consumer facing categories include Home, Lifestyle, Health and Mobility
- Business facing include Retail, Health, Energy, Mobility, Cities, Manufacturing, Public / Services and "Other"
- Many of the current solutions are standalone, and either deliver data within an entity, or from multiple consumer / industrial sensors to a centralized entity such as an OEM or a power company, for example
- **While IOTA solutions can find applications in most categories, we believe there are 8 core verticals where early progress is likely**
- **Data marketplaces and AI applications span multiple industries and introduce a payment or value transfer layer alongside the data transfer layer**

Figure: IoT Segmentation according to IoT Analytics



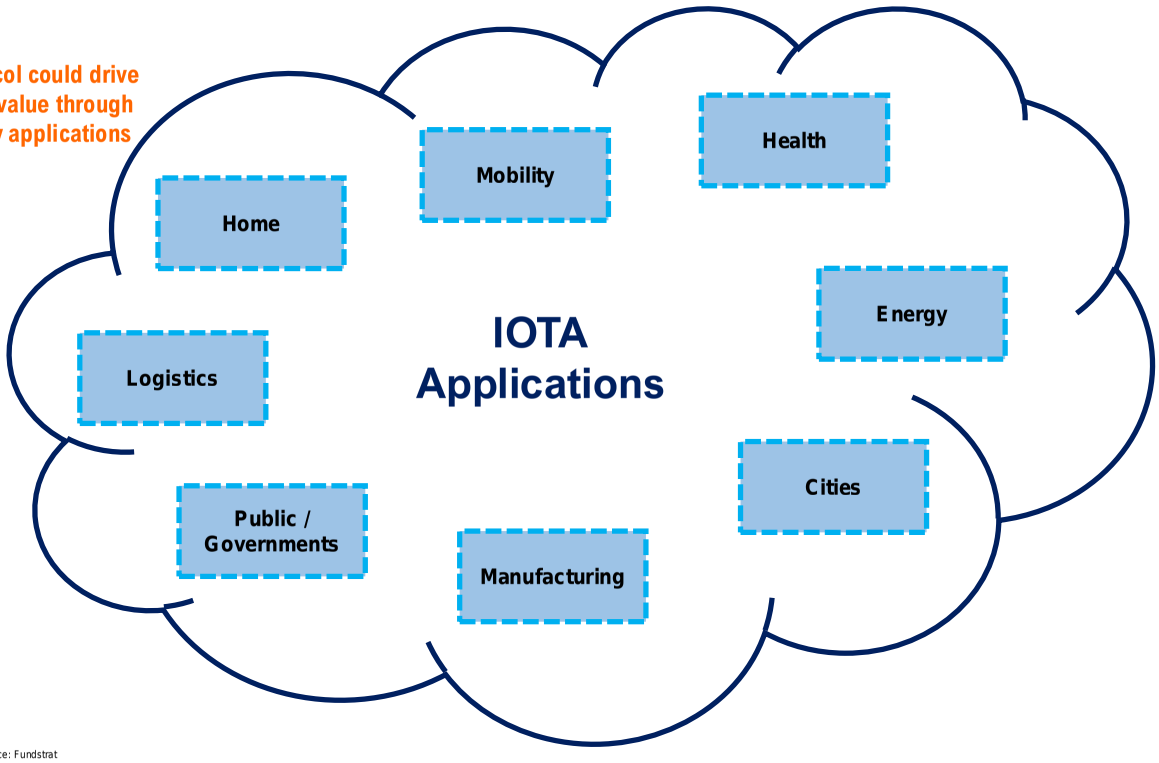
Source: IoT Analytics

Addressable Market & Valuation

IOTA's core offering spans 8 services or markets

The potential for a multi-trillion-dollar opportunity in DLT, IOTA's platform, standards initiatives and scalable technology (in theory), all point to the potential long term value of IOTA's token.

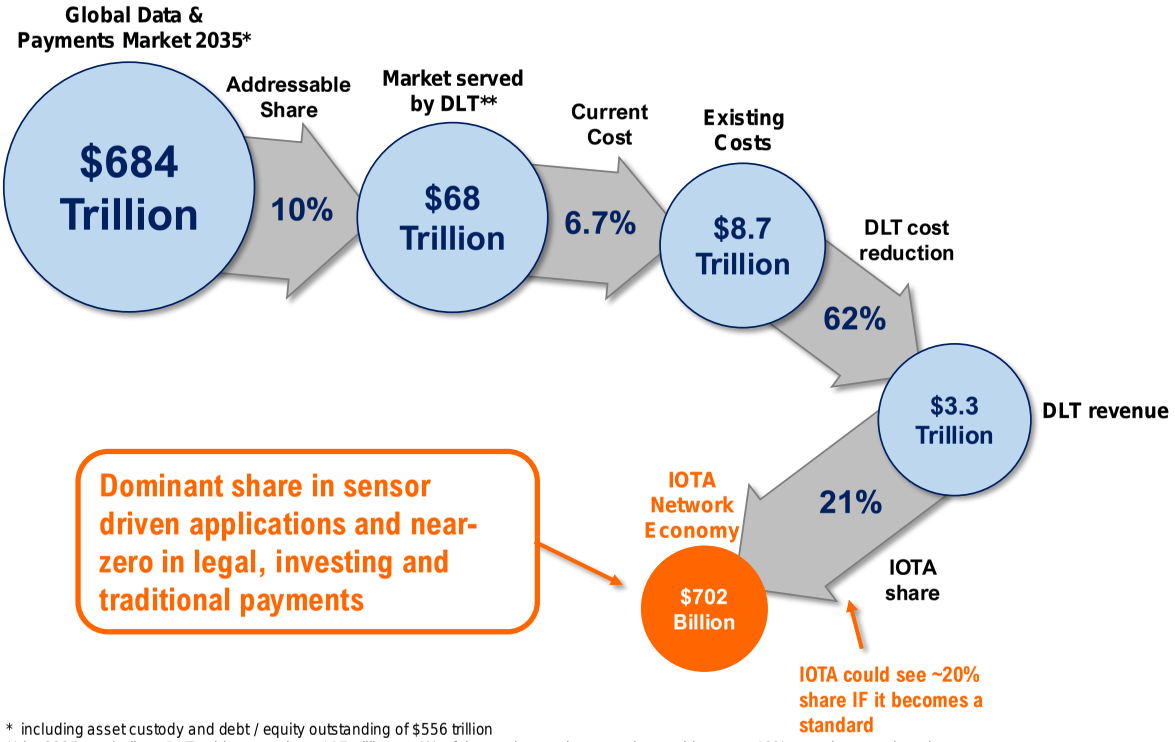
IOTA protocol could drive economic value through third-party applications



Source: Fundstrat

IOTA network economy could grow to $700 billion by 2035

IoT should accelerate into 2025 and begin to stabilize by 2030-35. See slide 68 for market value build.



* including asset custody and debt / equity outstanding of $556 trillion

** by 2025, we believe DLT addresses about $17 trillion or 4% of the market, and penetration could grow to 10% over the next decade

Source: Fundstrat

We assume value from the IOTA network will accrue to the protocol layer based on the equation of exchange valuation framework

	Equation of exchange	Supply scarcity	Yield
Summary	• MV = PQ • Size of asset base x money velocity = price of digital resource x quantity of goods • A certain "asset base" or market value is necessary to support an economy with velocity, *v*	• Enough demand for a token with limited supply will naturally drive up price • This applies to commodity type digital assets and collectible tokens (ERC-71, for example)	• With fee-based networks, staked nodes can expected a yield for their contribution to the network • This yield can be valued relative to the value flowing through the network
Examples	IOTA	bitcoin	Hedera Hashgraph
	ethereum	MONERO	Algorand
	EOS	Dash	deCRED

Source: Fundstrat, Joel Monegro, Chris Burniske

Valuation: If IOTA succeeds, the network could be worth ~$280B

- We estimate the future value based on:
  a. $700B+ of economic activity on IOTA, if successful
  b. An annual velocity of MIOTA of 2.5x
  c. 2.8 billion MIOTAs outstanding
  d. Implied future value would be $280 billion or $101 per MIOTA using MV=PQ
- This implies a 45% discount rate to get from the current $0.27 price to the future value. This compares with standard venture discount rates for Series A/B funding (slide 70)
- **Clearly, future value is conditional on adoption and on the assumed velocity of MIOTA**

Figure: IOTA Valuation
$ billion except per unit

		2035
Annual IOTA Ecosystem, US $B	a	**$702**
Total Miota in circulation, billions	b	2.78
Velocity of Miota, p.a.	c	2.5
Implied 2035 Market Cap, US $B	d = a / c	**$281**
Implied 2035 Price of Miota, US $	e = d / b	$100.98
Current price, US $		$0.27
Implied discount rate		**44.8%**

Market is discounting success at 45% per annum

Source: Fundstrat
Note: MV = PQ implies Price of MIOTA = $463 B economy / 1.5 Velocity / 2.8B MIOTA tokens in existence

Valuation: Monte Carlo Simulation helps understand the sensitivity to our assumptions

We ran a simulation 50000 times to model outcomes ***if IOTA is successful***

- Each iteration randomly samples inputs based on our estimate of the DLT economy as per the distribution below, assuming a standard deviation of 10% of the baseline estimates
- The resulting range of future market cap and token price per MIOTA is shown on the following pages
- The implied discount rate is one that reconciles that future value back to the current MIOTA price of $0.27
- **KEY TAKEAWAY: Even a wide range of assumptions results in a fairly narrow range of implied discount rates around 45% per annum**

Figure: Monte Carlo simulation summary
$ billions except per MIOTA value. 50000 trials μ = mean, σ = standard deviation

Key 2035 Variables

	μ	σ	Bottom-up Value
Total Addressable Market			$128,818
Market Served by DLT	$67,926.6	$6,797.7	$68,005
Share Substituted by DLT	52.7%	5.3%	52.8%
DLT Market Size	$2,823.7	$435.0	$3,310.1
IOTA Share	21.2%	2.1%	21.2%
IOTA Market Size	$598.4	$110.2	$702
Velocity	2.50	0.25	2.50

Simulation shows market is discounting future potential narrowly around 45% a year

Results

	μ	σ	Bottom-up Value
Implied Market Cap - 2035	$241.9	$51.3	$280.7
2035 Implied Price	$87.02	$18.44	$100.98
Current Price			$0.27
Implied Discount Rate	43.3%	1.9%	44.8%

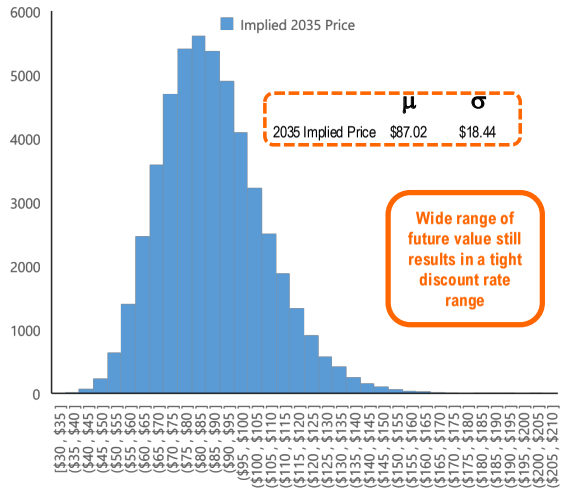
Source: Fundstrat

Valuation: Monte Carlo results show a wide price but narrow discount rate range

The 50000 run simulation distribution results are shown below

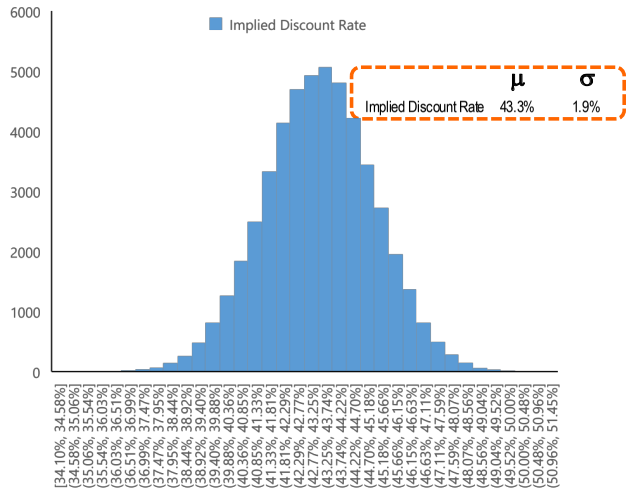
- **2035 Price range is distributed around ~$90, with a range from $50-125**
- **The Implied Discount Rate, which reconciles the future value to the present, ranges from 38-48%, centered around ~45%**

Figure: Monte Carlo results: 2035 MIOTA price distribution
$ per MIOTA, 50000 trials. μ = mean, σ = standard deviation



Source: Fundstrat

Figure: Monte Carlo results: Implied Discount Rate
% per annum, 50000 trials. μ = mean, σ = standard deviation



Valuation: By 2035, IOTA could be worth ~$280B or $100/MIOTA, but could range widely

Per MIOTA future price is more likely in the $70-140 range

Figure: 2035 IOTA market capitalization and MIOTA token price sensitivity to the size of the IOTA economy and velocity of IOTA tokens
$B, except per MIOTA token price in lower table, 50000 trial simulation

2035 Market Cap could be around $200-400B

Velocity \ Economy Size	$100	$200	$300	$400	$500	$600	$700	$800	$900	$1,000	$1,100	$1,200
0.50	$200	$400	$600	$800	$1,000	$1,200	$1,400	$1,600	$1,800	$2,000	$2,200	$2,400
1.00	$100	$200	$300	$400	$500	$600	$700	$800	$900	$1,000	$1,100	$1,200
1.50	$67	$133	$200	$267	$333	$400	$467	$533	$600	$667	$733	$800
2.00	$50	$100	$150	$200	$250	$300	$350	$400	$450	$500	$550	$600
2.50	$40	$80	$120	$160	$200	$240	**$280**	$320	$360	$400	$440	$480
3.00	$33	$67	$100	$133	$167	$200	$233	$267	$300	$333	$367	$400
3.50	$29	$57	$86	$114	$143	$171	$200	$229	$257	$286	$314	$343
4.00	$25	$50	$75	$100	$125	$150	$175	$200	$225	$250	$275	$300
4.50	$22	$44	$67	$89	$111	$133	$156	$178	$200	$222	$244	$267
5.00	$20	$40	$60	$80	$100	$120	$140	$160	$180	$200	$220	$240

And token price around $70-140

Velocity \ Economy Size	$100	$200	$300	$400	$500	$600	$700	$800	$900	$1,000	$1,100	$1,200
0.50	$71.95	$143.91	$215.86	$287.82	$359.77	$431.73	$503.68	$575.64	$647.59	$719.55	$791.50	$863.46
1.00	35.98	71.95	107.93	143.91	179.89	215.86	251.84	287.82	323.80	359.77	395.75	431.73
1.50	23.98	47.97	71.95	95.94	119.92	143.91	167.89	191.88	215.86	239.85	263.83	287.82
2.00	17.99	35.98	53.97	71.95	89.94	107.93	125.92	143.91	161.90	179.89	197.88	215.86
2.50	14.39	28.78	43.17	57.56	71.95	86.35	**100.74**	115.13	129.52	143.91	158.30	172.69
3.00	11.99	23.98	35.98	47.97	59.96	71.95	83.95	95.94	107.93	119.92	131.92	143.91
3.50	10.28	20.56	30.84	41.12	51.40	61.68	71.95	82.23	92.51	102.79	113.07	123.35
4.00	8.99	17.99	26.98	35.98	44.97	53.97	62.96	71.95	80.95	89.94	98.94	107.93
4.50	7.99	15.99	23.98	31.98	39.97	47.97	55.96	63.96	71.95	79.95	87.94	95.94
5.00	7.20	14.39	21.59	28.78	35.98	43.17	50.37	57.56	64.76	71.95	79.15	86.35

Source: Fundstrat

Valuation: ...implying market is discounting future IOTA ecosystem size by 25-65% / year

A discount rate in the 42-48% range would reconcile modal 2035 "case success" price expectations with the current MIOTA price of $0.27

Figure: Implied discount rate to reconcile 2035 IOTA Economy size to current MIOTA price
IOTA economy size in $ billion Discount rate in % p.a.

Likely discount rate range of 42-48%

Velocity \ Economy Size	$100	$200	$300	$400	$500	$600	$700	$800	$900	$1,000	$1,100	$1,200
0.50	41.8%	48.1%	51.9%	54.6%	56.8%	58.6%	60.1%	61.5%	62.6%	63.7%	64.7%	65.6%
1.00	35.8%	41.8%	45.4%	48.1%	50.1%	51.9%	53.3%	54.6%	55.8%	56.8%	57.7%	58.6%
1.50	32.4%	38.2%	41.8%	44.3%	46.4%	48.1%	49.5%	50.7%	51.9%	52.9%	53.8%	54.6%
2.00	30.0%	35.8%	39.3%	41.8%	43.8%	45.4%	46.8%	48.1%	49.1%	50.1%	51.0%	51.9%
2.50	28.2%	33.9%	37.3%	39.8%	41.8%	43.4%	**44.8%**	46.0%	47.1%	48.1%	48.9%	49.8%
3.00	26.8%	32.4%	35.8%	38.2%	40.2%	41.8%	43.1%	44.3%	45.4%	46.4%	47.3%	48.1%
3.50	25.5%	31.1%	34.5%	36.9%	38.8%	40.4%	41.8%	43.0%	44.0%	45.0%	45.8%	46.6%
4.00	24.5%	30.0%	33.3%	35.8%	37.7%	39.3%	40.6%	41.8%	42.8%	43.8%	44.6%	45.4%
4.50	23.6%	29.1%	32.4%	34.8%	36.7%	38.2%	39.6%	40.7%	41.8%	42.7%	43.6%	44.3%
5.00	22.8%	28.2%	31.5%	33.9%	35.8%	37.3%	38.7%	39.8%	40.8%	41.8%	42.6%	43.4%

Source: Fundstrat

IOTA's 80% sector mkt cap share supports "winner take all" thesis

- IOTA has over 80% share of the IoT category.
- The next largest token, Waltonchain, has about 6% share.
- The implication is: Market is uncertain that DLT will be a viable solution for IoT use cases, or that a specialized DLT will out-compete a general purpose solution.
- **But if a specialized solution wins, the market believes it will very likely be IOTA**

Figure: IOTA dominates the IoT-focused cryptocurrency category

#	Name	Marketcap	Price	Volume	Location	Blockchain
1	IOTA MIOTA	$686.54M	$0.24700	$7,424,212	N/A	Own Blockchain
2	Waltonchain WTC	$48.22M	$1.14130	$4,513,132	China	Ethereum (ERC20)
3	IoTeX IOTX	$17.72M	$0.00430	$678,479	Singapore	Ethereum (ERC20)
4	Robotina ROX	$14.3M	$0.04809	$134,787	Republic of Slovenia	
5	IoT Chain ITC	$13.23M	$0.15933	$2,252,410	N/A	
6	Ruff RUFF	$9.71M	$0.00991	$1,109,346	N/A	Own Blockchain
7	Artfinity AT	$6M	$0.04656	$2,201,368	N/A	Ethereum (ERC20)
8	Smartshare SSP	$4.25M	$0.00092	$3,041,764	N/A	Ethereum (ERC20)
9	CPChain CPC	$4.21M	$0.01119	$629,820	Shanghai, China	Ethereum (ERC20)
10	Machine Xchange Coin MXC	$2.95M	$0.00370	$3,107,240	Berlin, Germany	Ethereum (ERC20)

84% share of category market cap

Source: Fundstrat, Cryptoslate.com

Summary Valuation: If successful, IOTA could be worth $280B by mid-'30s

- **At $0.27 per MIOTA, the market discounts long term success at a ~45% discount rate.**
- **The token has underperformed its platform peer group**
- **Long term, adoption of IOTA standards, design wins and real-world deployments are key milestones to measure success and receding risk**

Methodology: MV=PQ	Future Valuation	Implied Discount Rate
Low adoption simulation	$200 billion	42%
Base-case simulation	**$280 billion**	**45%**
High adoption simulation	$400 billion	48%

Source: Fundstrat

Downside risks to the thesis

- Adoption of Crypto and Distributed Ledger technologies could lag expectations
- IOTA technology deployment may prove slower or less robust than plan
- IOTA may fail to sign on major partners in the key automotive and Smart City space, or design wins in semiconductor or device manufacturers may lag, affecting the adoption curve and market share for IOTA
- Fragmentation among competing DLT solutions could slow adoption until clear and/or interoperable standards emerge. This could lead to an undershoot on network utilization and thus our network value estimate
- Decentralized apps on the network could fail to deliver compelling end-use applications that drive adoption
- Coordicide fails to deliver on its promise of decentralization, or proves difficult to implement in practice
- Crypto is a volatile asset class with the potential for the category or any particular token or project to eventually prove worthless and is not suitable for every investor
- The opinions expressed in this report are the beliefs of the author at the time of publication. Fundstrat does not commit to update this report and is not responsible for any independent investment decisions made by a reader, based on this and / or any other sources of information

Source: Fundstrat

Upside potential for the thesis

- IoT adoption could accelerate faster than expected as equipment and services costs continue to fall
- Improvements in AI and other enabling technologies help expand autonomous decision making by machines. Transaction volume surprises to the upside both in terms of number of transacting parties and frequency of transactions
- DLT adoption accelerates as projects and solutions achieve critical mass in multiple use cases
- IOTA believes the Tangle technology is more scalable than Blockchain technology. Should this be proven correct IOTA may lead DLT adoption and gain larger share than our Base Case
- Micropayments are a key use case that leverage native capabilities of the IOTA platform. Accelerating adoption of DLT for machine to machine micropayments could benefit IOTA and expand market share and addressable market sooner than we model
- As IOTA achieves critical milestones on the technology, governance and end market adoption, the risks to the project would diminish, reducing the discount rate and boosting valuation – However, that would affect future valuation and potential returns to holders of the token, rather than reflect fair value today

Source: Fundstrat

Technical Overview

IOTA's Tangle is resource efficient and faster than typical PoW / PoS consensus algorithms

Tangle

- IOTA uses a DAG or Directed Acyclic Graph topology. Each node that has transaction(s) to add to the tangle, validates two unconfirmed transactions using a "tip selection algorithm"
- A completed validation does not cause other in-progress transactions to be discarded, allowing for higher throughput and increased network speed – validations can proceed in parallel
- Transactions are feeless – the incentive to participate in the network is that a node's own transactions will be validated in turn. Hardware and speed specs are low for most nodes, but validating two transactions can be viewed as a small proof of work
- **IOTA's Tangle implementation leads to high and scalable transaction speeds with low computational load, in party because the Tangle does not require mining work.**

Proof of Work

- Traditional Proof of Work systems such as Bitcoin and (currently) Ethereum require "miners" to solve complex cryptographic puzzles with a brute force approach
- The first miner to solve the puzzle receives the entire reward, and all miners then start over on the next, sequential block and the next puzzle, discarding any efforts spent on the current block
- Miners have an incentive to increase their share of computing power to increase their likelihood of winning the next reward, resulting in an escalating scale of the network – for example, the Bitcoin network represents $5-6 billion of capital investment and consumes about 6GW of electricity
- **Thus proof of work tends to be relatively slow and resource-intensive, and has difficulty scaling**

Proof of Stake

- A Proof of Stake system requires transaction validators to "stake" their token holdings, and vote on the validity of the transaction, with the weight of their vote usually proportional to their holdings
- Nodes share in the fees paid by customers for network usage, proportional to their stake. PoS systems tend to be faster than PoW
- Every active node receives a share of network cash flow, and the incentive is to hold tokens and receive a regular payout based on network activity
- **POS is resource efficient because capital is held as a liquid asset rather than being deployed as depreciating mining equipment.**

Source: Fundstrat

What is the Tangle consensus and transaction selection process?

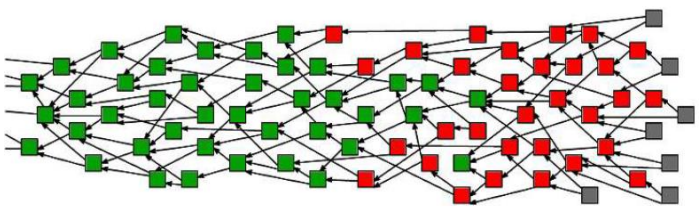
A Directed Acyclic Graph

A DAG is a consensus alternative to the blockchain. In a DAG such as IOTA's Tangle, each point in the graph is a transaction or a related bundled set of transactions. The network accepts each transaction once it has validated two preceding transactions using a cryptographic hash or signature. There is a check to ensure the two preceding transactions do not conflict with each other.

The algorithm must select two tips (preceding transactions) non-randomly, nor just the newest tips, to ensure that all transactions are approved as fast as possible, avoiding orphan transactions – those that aren't approved even after long periods of time.

This architecture overcomes the bottlenecks of traditional Blockchains and promises the goal of decentralized, scalable and energy-efficient consensus.

Figure: Schematic of IOTA's tip selection process



Tip selection process achieves consensus without orphan transactions

Source: Fundstrat, IOTA, Center for Information Assurance

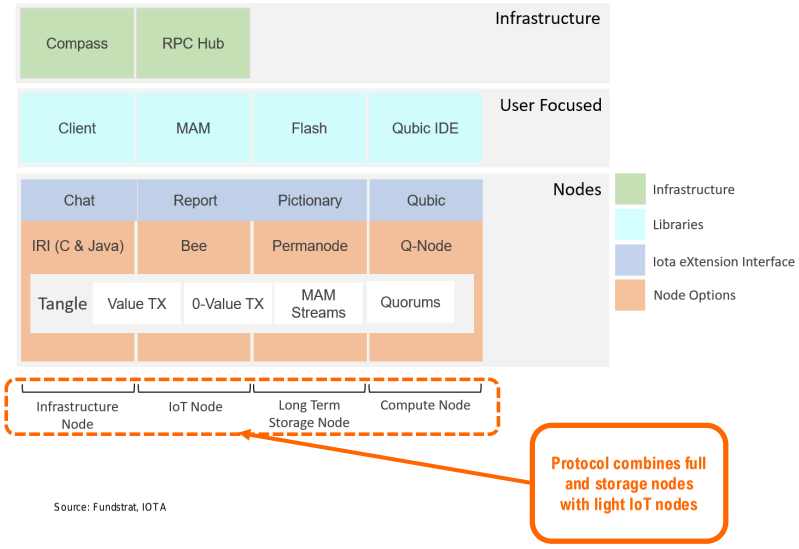
IOTA Network Topology designed for commercial solutions at scale

The IOTA Foundation has developed a range of different client software, modules and libraries to provide the full flexibility and power in utilizing IOTA in various environments. This modularity is aimed at enabling commercial solutions and market-readiness.

- **Full Node** stores all transactions since the last snapshot of the network, and has to maintain 24/7 uptime. Full nodes are able to periodically delete data through a snapshot.
- **Permanodes** are data storage nodes which do not delete data in a snapshot and make this data available to other nodes in the network (paid or free).
- **Lightnodes** do not store transactions, but access network functionality through full nodes.
- **Bee** is a swarm client distributed node across multiple IoT devices.
- Modules & Libraries: The extensible architecture makes it easy to add new modules and extend the core functionality of IOTA, for example **MAM** enables secure, encrypted data streams

The IOTA Foundation primarily develops in Rust, Java, C, JavaScript, Python, Go.

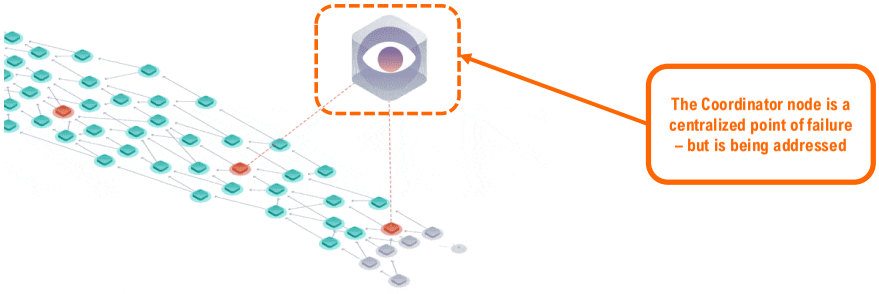
Figure: Schematic of IOTA Network topology



Source: Fundstrat, IOTA

The Coordinator – a centralized node was a concern that is being addressed…

- As discussed earlier, the goal of the distributed ledger is to balance Scalability, Security, and Decentralization, which involve tradeoffs that can be difficult to manage
- IOTA initially ran a special node called the "Coordinator" to publish transactions called "milestones" to form checkpoints on the Tangle – a security mechanism similar to Bitcoin until 2013
- This node helps ensure security while maintaining scalability / speed, by in effect assisting the network in the confirmation process
- The Coordinator needed to validate every transaction at least indirectly via inclusion in a milestone
- While this helped protect the network against certain attack vectors, it faced legitimate criticism that it created a centralized point of failure and attack target. It also went against the decentralized ethos of the crypto community
- However, IOTA management has viewed the Coordinator as a temporary solution until the tangle achieved the scale needed to have built-in resilience

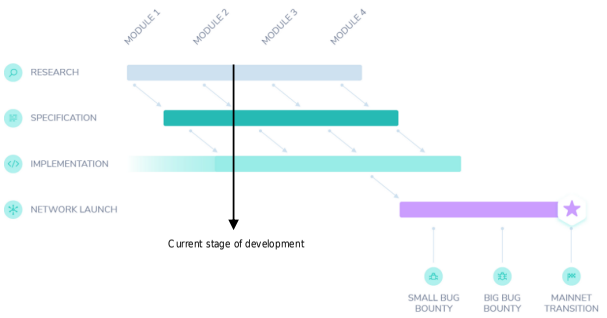


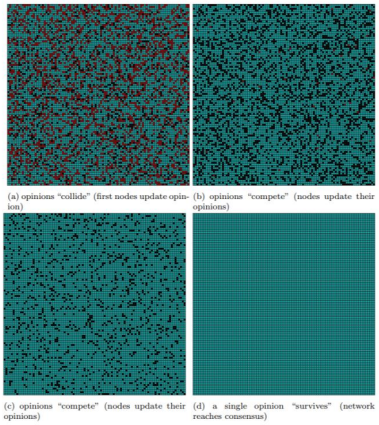
Source: Fundstrat, IOTA - https://files.IOTA.org/papers/Coordicide_WP.pdf

Coordicide – Removing the Coordinator and becoming truly decentralized

- IOTA has published its blueprint for removing the coordinator and fully upgrading the IOTA protocol.
- In this new version of the protocol, each node earns "Mana" or reputation, by validating transactions and having them accepted in turn by other nodes. The idea is that the reputation itself becomes valuable, and cannot be easily transferred between node operators.
- The reputation creates a voting mechanism that gives "honest" nodes a greater say in the consensus process and makes it possible to reach consensus within seconds.
- A new node would have to invest time validating transactions to gain the reputation needed to act maliciously, and thus lose the incentive to act maliciously. The idea rests on the notion of sufficient scale in the network to create enough "reputation" across enough nodes to raise the bar for a malicious actor to an unreasonable / unsustainable level.
- **This new consensus algorithm claims for IOTA to be the first fully decentralized, scalable, secure and feeless distributed ledger protocol.**

Figure: Coordicide implementation timeframe





Source: Fundstrat, IOTA - https://files.IOTA.org/papers/Coordicide_WP.pdf

Coordicide – Benefits

- **IOTA's coordicide proposal claims to resolve the decentralization trilemma and introduce a DLT that is enterprise-ready for adoption**
- **IOTA is collaborating with several universities to accelerate Coordicide**
- **Prototype was launched end of July, with the first alphanet launching in August**
- **The Foundation has committed more than $5m in grants for universities and researchers to accelerate the development and ensure the security of the Coordicide implementation**

DECENTRALIZED & PERMISSIONLESS

Unlike other DLTs, IOTA's solution does not compromise decentralization in any way.

FINALITY WITHIN SECONDS

Transactions reach finality in seconds without having to wait for confirmations by external entities. A massively reduced need for reattachments increases the reliability of transactions.

SCALABLE & LIGHTWEIGHT

Truly limitless scalability with no protocol-related bottlenecks. The network is limited only by hardware and the laws of physics.

MODULAR & FUTURE PROOF

Much like the Internet Protocol, a layered approach enables extension of the base protocol through additional modules.

FEELESS & DATA TRANSACTION

Feeless transactions enable the secure transfer of data and values between humans and machines, opening up new business models based on micro-payments.

RELIABLE GOVERNANCE & OPEN SOURCE

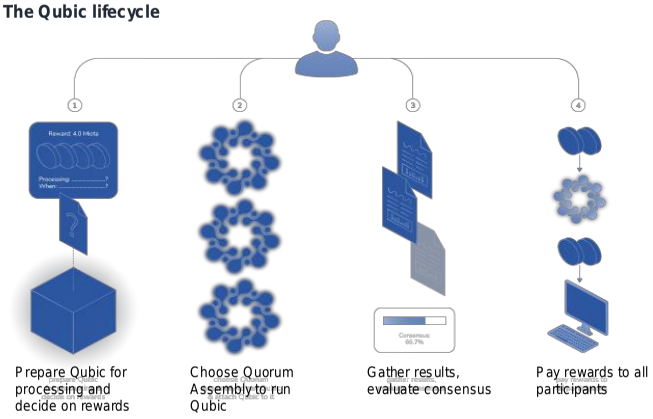
The nonprofit organization behind IOTA drives the adoption and evolution of its free and open source technology without any collusion of interests with 3rd parties like miners.

Source: Fundstrat, IOTA - https://coordicide.iota.org/

Qubic: Quorum Based Computation for smart contracts and oracle machines

- **The IOTA Foundation is currently working on a novel oracle solution, called Qubic (Quorum based Computation).**
- **Qubic makes it possible to execute code in a decentralized setting and gather and validate data in real-time.**
- **This approach to smart contracts is a module that extends the core functionality of IOTA and enables new applications in IoT, Finance, Supply Chain and more.**
- **A team of hardware experts is currently working on the first FPGA implementation for Qubic**

Figure: The Qubic lifecycle



Qubic allows real-time decentralized validation

Source: https://qubic.iota.org
Note: A blockchain oracle is a third-party information source that supplys data to permit the creation of smart contracts

Case Studies

Startup ecosystem: Smart cities, waste management, connected cars, machine learning…

- IOTA has a strong independent startup community building on top of the protocol. Because it is open source, IOTA may not be aware of all startups incorporating IOTA into their product / services
- We list a few illustrative examples of IOTA startups here, with more details on each in the appendix

Smart waste management system

Lidbot sends you alerts when your waste & recycling bins are full.

Stick lidbot to any waste or recycling container and Lidbot will notify you when the bin is full or emptied.

Privacy-compliant AI based automation

XAIN.

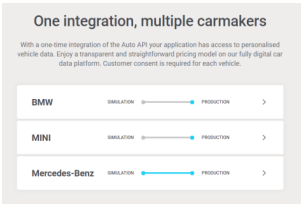
INTRODUCING ANDY

The First XAIN-powered AI application.

ANDY is the first AI-based automation software powered by the eXpandable AI Network.

With XAIN, the solution for automated invoice processing is able to consolidate training knowledge from different data sources, while fully preserving data privacy.

High-mobility is vehicle testing platform with personalized car data

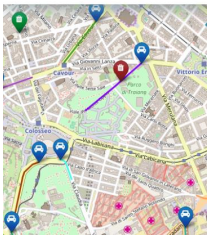


birdz

Customer IoT Platform

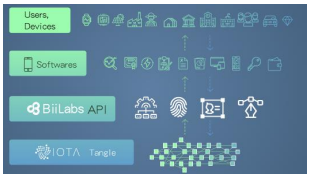
Smart water management system

IOTIFY



IoT simulation and hardware emulation

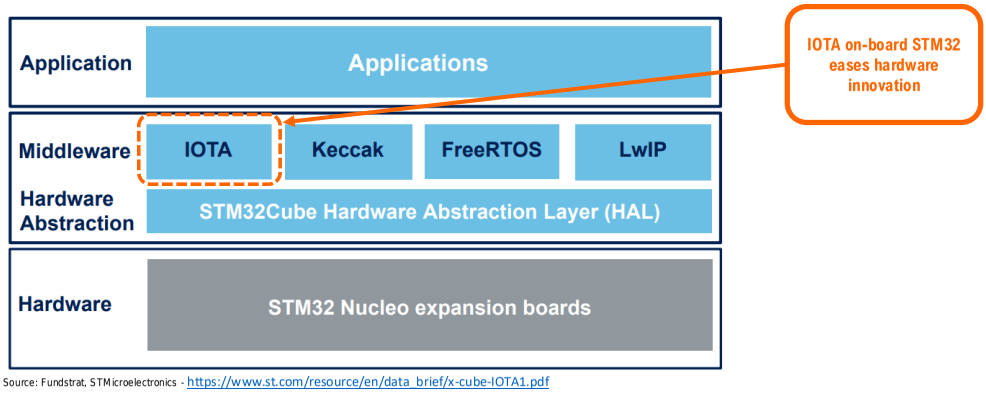
BiiLabs is decentralized ID solution in Taipei



STMicroelectronics has integrated IOTA into its developer boards

- STMicroelectronics recently announced the integration of the IOTA middleware into the STM32 Microcontroller with a free license
- Designers can build and test designs on a variety of test boards such as Arduino to easily create applications that interface with the IOTA middleware implementation
- The software is easily portable across different STM32microcontrollers, and comes with sample implementations and graphical visualization tools to use the IOTA middleware on a NUCLEO-F429ZI or NUCLEO-F746ZG development board
- STM's capabilities makes the transition from early Proof of Concept towards ready-to-ship products easy, cheap and fast

Figure: IOTA middleware solution is available to developers on STM32 Microcontrollers



Source: Fundstrat, STMicroelectronics - https://www.st.com/resource/en/data_brief/x-cube-IOTA1.pdf

IOTA has smart city initiatives in several European, US and Asian cities

- **Smart Cities are key to the adoption of new IoT-based solutions for efficiency, cost saving and quality of life solutions**
- **The IOTA Foundation has more than 10 partner cities already and is expanding its network globally**

Scoping an international network of IOTA smart city initiatives

From Europe to Asia and the US

UNITED STATES	EUROPE	EUROPE	ASIA	. . .
Austin, Texas	**Trondheim**, Norway*	**Limerick**, Ireland*	**Taipei City**, Taiwan	**And more to come**





Sharing Knowledge, Best practice and Opportunities for partners across the city network

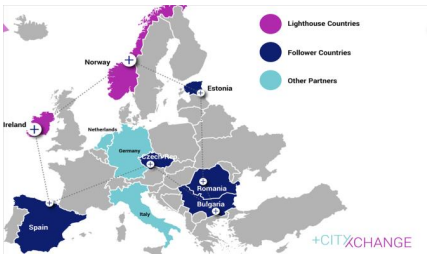
*as part of CityXChange

Source: IOTA

CityXChange is a 20M Euro funding program to test Smart City projects

- **The IOTA Foundation is a recipient of the grant to partner with 20+ of Europe's highly respected businesses to create IOTA-based Energy and Smart City use cases.**
- **The goal is to build physical test beds to prove the viability of the IOTA solution**
- **As a non-profit, IOTA intends to create reference solutions and "success stories" that can then be deployed by third parties as needed**

Government collaboration crucial for adoption



+CITYXCHANGE

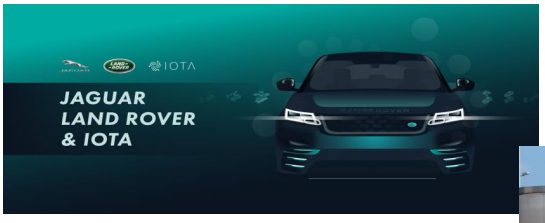
- Flagship Smart City Project
- 7 cities
- goal: setup physical testbeds
- Funded with 20 Million EUR from Horizon2020
- 20+ companies goal here is it to setup physical testbeds
- develop IOTA-based Energy and Smart City use cases

Source: IOTA

Jaguar Land Rover partnership example of IOTA's powerful auto roadmap

- **Testbed deployment in the Ireland R&D facility focused on proofs of concept**
- **Primarily a software solution layered onto the infotainment system, which enables cheap and easy retrofitting into late-model vehicles eventually**
- **If successful, IOTA is seeking to encourage auto OEM partners to develop global technology standards to enable new ways of paying for existing services (tolls, parking) as well as allow new applications including peer-to-peer parking and charging services**
- **In addition, data sharing could alert authorities and other vehicles about road and traffic conditions, and allow dynamic dispatch of emergency responders and maintenance crews to the right sites**

IOTA partners and their developments can be leveraged
Jaguar Land Rover's IOTA-enabled Car Smart Wallet



Vehicles are now connected and acts as data aggregators. Car Wallet enables data stream monetisation and opens many possible use cases which will transform vehicles in Autonomous Economic Agents:

- Pay seamlessly for charging, tolls, parking
- Monitor road conditions and report to road authorities
- Replace toll gates with Satellite/GPS location based realtime payments
- ....

Testing tolling and road condition reporting

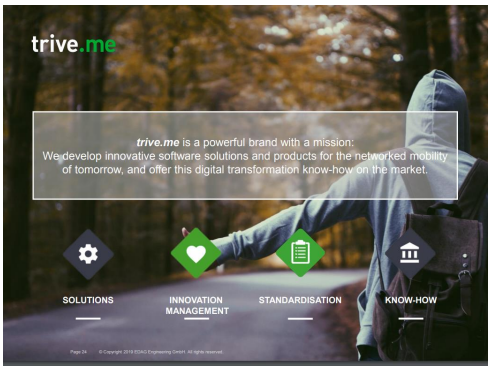
https://blog.IOTA.org/earn-as-you-drive-with-jaguar-land-rover-and-IOTA-3c744d8c0cba

Source: IOTA

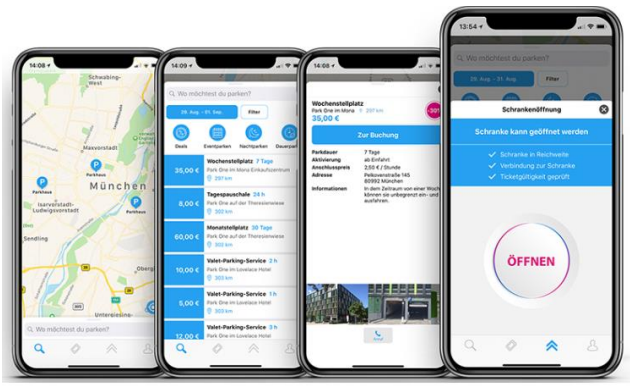
EDAG Group's trive.me IOTA integration shows traction with major auto engineering firm

- **EDAG Group (8500 employees, €790M sales) is a leading German auto development and production consulting and services firm**
- **The trive.me subsidiary integrated IOTA into its parking app to allow drivers to find parking offers, reserve, access and pay for parking from the app, via Bluetooth**
- **The solution is integrated into the parking garage software, controlling the entry barrier and guiding the driver to the designated reserved space**
- **Trive envisions IOTA-enabled services like battery charging and auto service packages for the car while it is parked**

trive is a mobility subsidiary of German auto engineering group EDAG



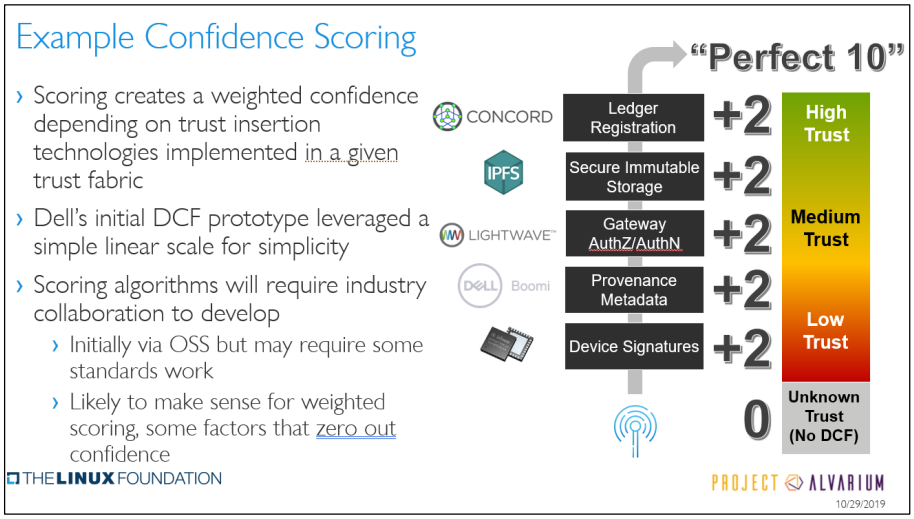
trive.park app integrates IOTA and enables value added services



Source: EDAG Engineering

Partnership with Linux and Dell shows the project's technology has demand from industry heavy weights

- **IOTA is a partner in the Linux Foundation (LF) and Dell's newly announced Project Alvarium, a collaboration including IBM, Arm, Unisys, OSISoft, MobiledgeX and Object Management Group.**
- **Project Alvarium is a Linux Foundation project that aims to create a framework to measure confidence in the provenance and integrity of data.**
- **This initiative is important for IOTA because it can focus on building out the infrastructure while Dell builds out the application layers. Dell integration also accelerates IOTA's penetration into the ecosystem, including other edge device makers, reducing time to market and reducing development costs for the IOTA Foundation as it continues to focus on the core technology.**



Source: Linux, IOTA

Higher-scoring data outweighs or overrides conflicting lower scoring data

Appendix

A Distributed Ledger disintermediates trust providers

- A distributed ledger maintains immutable records of each party in the transaction
- Each set of transactions is "signed" through a cryptographic hash process.
- If a previously validated transaction is changed, the hash signature would be invalid not only on the transaction set that was modified, but also each subsequent transaction set, unless a new hash signature was created for all affected transaction sets
- Since the identical ledger exists in multiple, unrelated entities, any changes to the ledger and the resulting hashes needs to be reflected in a large number of copies before it is accepted as true and replicated in the remaining copies of the ledger
- This creates trust that the network agrees on all transactions being processed, and the ability of the party to conduct the transaction (e.g. that it actually has the funds it is attempting to spend, and hasn't spent them elsewhere)
- The primary cost of the distributed ledger system is the basic KYC / AML provision and the operating cost of the network.
- Protection against fraudulent transactions is built into the system and does not require "insurance premiums" to be charged, reducing the cost of providing trust
- A distributed ledger can be slower than centralized processing owing to the time for the transactions to propagate throughout the network.

- **However, newer DLT technologies such as IOTA's Tangle have done much to mitigate this bottleneck.**

A general introduction to Blockchain

- **Blockchain** is a distributed database existing on multiple computers at the same time. It is constantly growing as new sets of recordings, or 'blocks', are added to it. Each block contains a series of transactions or other information, a timestamp and a link to the previous block, and a cryptographic hash or signature. Any change to a block changes the signature, which affects the header field for the next and subsequent blocks. Thus, any altered block is immediately identifiable, making the blockchain immutable.
- **Distributed Ledger** is a more general version of a blockchain, and encompasses other constructs, as long as the ledger is independently replicated across multiple computers with no single computer acting as the source of data in the ledger.
- **Consensus** is the process by which all of the computers reconcile their version of the database and come to an agreement as to which entries to add into their database in the latest block, and to discard their block and replace it with the one a minimum percentage of other computers (typically 51%-67%) all agree is the valid block.
- **Bitcoin,** the most popular blockchain cryptocurrency, has been evolving into a store of value, while another popular blockchain cryptocurrency, **Ethereum,** is developing use cases in areas such as decentralized applications, smart contracts and token issuance
- **Proof of Work** is the process by which Bitcoin or other token "Miners" process and validate transactions, with the first miner to solve a cryptographic puzzle validating the block and receiving a reward (currently 12.5 bitcoin each); other miners have to then replicate the result to confirm and move on to the next block.
- **Proof of Stake** is a validation process by which owners of the token "stake" their holdings on a node to vote on the validity of a given block, and have voting rights and potentially receive rewards proportional to their staked holdings. Examples include Binance Coin (BNB, 0% annual yield), Dash (DASH, 6.44% APY) and Decred (DCR, 10.53% APY), where yields are measured in token terms, not USD.
- **Directed Acyclic Graph** is a form of distributed ledger where each transaction or group of transactions validates multiple algorithmically selected preceding transactions, in parallel with each other. This creates a web of connections linking a given transaction back through history to the original genesis transaction that launched the ledger. Because these validations take place in parallel, transaction throughput can scale with the size of the network, reducing speed bottlenecks commonly experienced in proof of work protocols.

- **IOTA's Tangle is an example of a Directed Acyclic Graph**

Could crypto become a store of value as its use case continues to evolve?

- Conventional definitions of store of value include gold, perhaps art, and to an extent, Bitcoin has staked itself on that narrative.
- But the story of a digital store of value hasn't evolved yet and could include things that are widely held.
- People generally view crypto as being about transaction fees or preventing double spend, but that could change: As SEC commissioner Hester Pierce noted recently, store of value could become important.
- **If IOTA is widely used, it could benefit from network effects that could include Store of Value**

Figure: SEC commissioner Hester Pierce on Store of Value in Crypto

SEC Commissioner Hester Peirce says digital assets could one day be 'the money of the internet'

SEPTEMBER 26, 2019, 2:20PM EDT

At a cryptocurrency compliance summit in New York hosted by Solidus Labs today, SEC Commissioner Hester Peirce spoke about the U.S. Securities and Exchange Commission's (SEC) views on cryptocurrencies, how the U.S. can improve the process for new regulations, and how the SEC enforces cryptocurrency fraud.

Peirce states that she views digital assets as "transaction mechanisms" and that she believes store of value is an important function of these assets. "Store of value, I think, is a really important function. I do think that we'll see as technology changes, that they become much more the money of the internet," Peirce said.

On the topic of U.S. regulation, Peirce agreed with the moderator's belief that the U.S. is becoming less competitive due to its slow turnaround on new regulations. "When I came to the SEC one of my hopes was to help change the way it addresses innovation. In my first round I saw it was slow," she added.

Peirce also noted that the SEC needs to "think about how we need to apply our enforcement resources" in the cryptocurrency space, adding that while the agency goes after fraud, they "also brought cases against people who have done offerings and didn't register it."

"The question is where in this spectrum you fall and how much we should spend on different parts of the spectrum," she concluded.

Source:https://www.theblockcrypto.com/linked/41169/sec-commissioner-hester-peirce-says-digital-assets-could-one-day-be-the-money-of-the-internet

DLT economy could reach ~$3.3T by 2035; IOTA share could exceed 20%

- **Our estimates suggest the DLT economy could be $3.3T of direct revenue, with IOTA gaining ~20% share - *should IOTA succeed in becoming the standard***
- **This compares with McKinsey's 2025 estimate of total value of the IoT economy of $11T, which also includes both equipment and other costs and economic gains and benefits of IoT**

Figure: Use cases and total addressable market sizes for DLT/blockchain technology

$ billions, Fundstrat estimates for DLT adoption

		Overall market size...				DLT share...				IOTA Share...		
			a	b	c = (a) x (b)	d	e = (a) x (d)	f	g = (b) x (e) x (1 - (f))	h	i = (h) x (g)	
	Application	Annual Transaction Value, $B	2035 Potential Annual Transaction Value, $B	Typical Fee / Spread / Cost Structure	2035 Costs	Share substituted by DLT in 2035	DLT Served Market	Cost Compression due to DLT	DLT Revenue	IOTA Share	IOTA Network economy	2018-2035 CAGR
Core use cases	IoT / Sensor Data	$294.4	$6,363.3	10.1%	$644.0	75%	$4,796.1	25%	$484.0	**65.9%**	$318.7	19.8%
	Smart Cities	8.1	155.5	100.0%	155.5	75%	116.6	25%	116.6	**67.0%**	78.1	18.9%
	Infrastructure	9.0	171.3	100.0%	171.3	75%	128.4	26%	126.9	**67.0%**	85.0	18.9%
	Energy	3.0	57.3	100.0%	57.3	75%	43.0	25%	43.0	**67.0%**	28.8	18.9%
	Agriculture	1.2	22.9	100.0%	22.9	75%	17.2	25%	17.2	**67.0%**	11.5	18.9%
	Health	0.9	17.2	100.0%	17.2	70%	12.0	30%	12.0	**58.9%**	7.1	18.9%
	Gaming	305.0	1,123.2	9.4%	105.6	52%	585.5	74%	27.8	**28.2%**	7.9	8.0%
	Logistics	2,216.8	5,149.1	100.0%	5,149.1	50%	2,574.6	61%	2,028.9	**7.5%**	152.6	5.1%
	Financing	553.8	5,906.8	6.5%	381.3	75%	4,450.0	74%	100.4	**7.7%**	7.8	14.9%
	Payments	43,268.3	106,038.7	1.6%	1,688.3	50%	53,375.3	82%	305.8	**1.4%**	4.2	5.4%
	Illiquid Investments	1,543.7	3,626.0	2.3%	84.5	50%	1,813.0	83%	14.8	**0.0%**	0.0	5.2%
	Legal	70.8	186.5	100.0%	186.5	50%	93.2	83%	32.6	**0.0%**	0.0	5.9%
	Total	**$48,275.1**	**$128,817.7**	**6.7%**	**$8,663.4**	**53%**	**$68,004.8**	**62%**	**$3,310.1**	**21.2%**	**$701.7**	**5.9%**

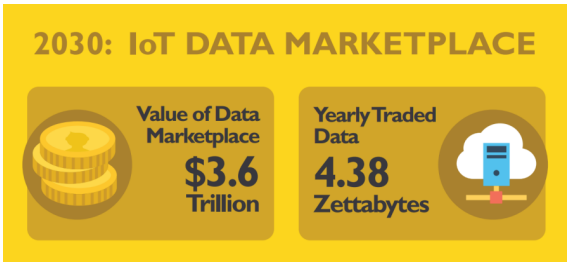
Source: Fundstrat, Statista, McKinsey, Forbes, gtreview, export.gov, sifma.org, visualcapitalist, pionline, artbasel, worldbank, willistowerswatson, Bloomberg, Fortune, abovethelaw, grandviewresearch, bravenewcoin, Circle & Fundstrat estimates

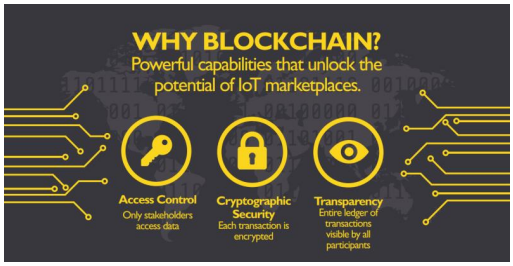
Note: This table excludes the size of the investment, custody and issuance / outstanding value for equities and Sovereign, Corporate and Agency / Local Govt markets, which we believe could top over $550 trillion in market value by 2035 (currently $300 trillion)

Western Digital & Accenture estimate $3.6 Trillion 2030 IoT Data Marketplace

- According to Accenture, many IoT data streams come from devices that control critical processes, infrastructure, and sensitive information.
- This makes IoT data a particularly good target for hackers, making trust and security concerns the number-one inhibitor of IoT adoption.
- Blockchain / Distributed Ledger Technology can provide the trust and security and incentive layer necessary to drive adoption of IoT data marketplaces
- In this Data Marketplace, entities, including machines, pay each other for the value of data
- Accenture projects blockchain enabled IoT marketplace revenue at $4.4 billion in 2030, or 0.1% of the $3.6T market value of the data being transacted

Figure: Western Digital and Accenture believe IoT data marketplace could be worth $3.6 Trillion, enabled by distributed ledger technology

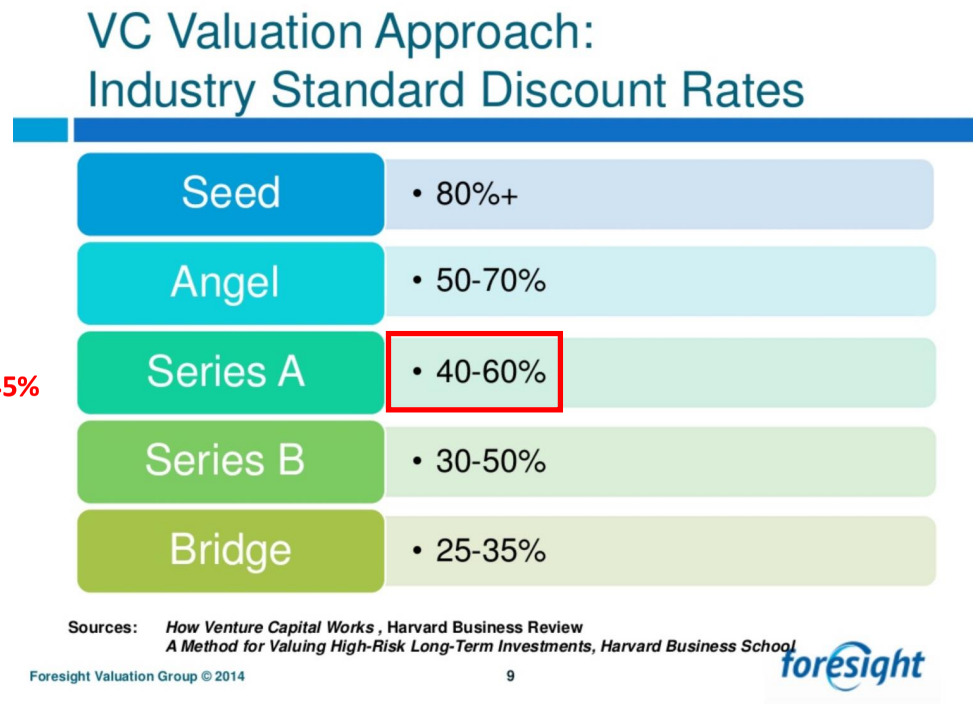




Source: https://www.accenture.com/us-en/insights/high-tech/dawn-of-data-marketplace

Sample VC discount rates: implied discount rate for IOTA is Series A

Implied IOTA Discount Rate ~45%



Source: Foresight Valuation Group

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