Deploying Enterprise Blockchains

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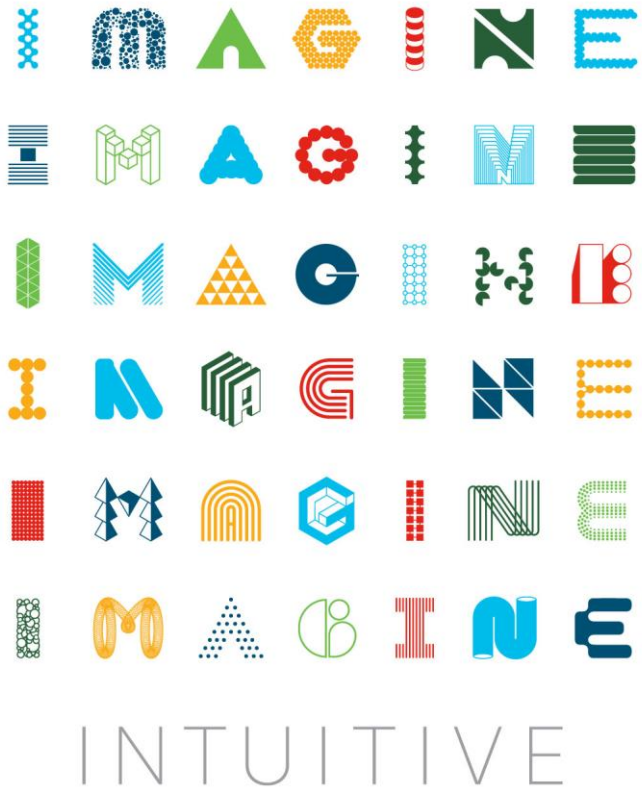
BRKGEN-1005



Agenda

- Introduction to Blockchain
- Deployment Models
- Cisco on Cisco
- Lessons Learned
- Opportunities
- Collaboration

Cisco Webex Teams

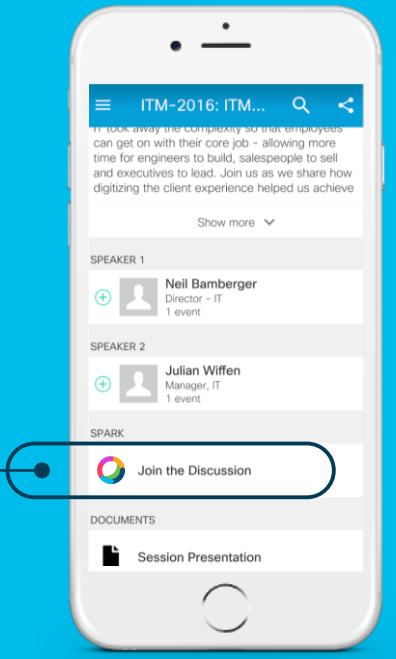
Questions?

Use Cisco Webex Teams (formerly Cisco Spark) to chat with the speaker after the session

How

1. Find this session in the Cisco Events App
2. Click “Join the Discussion”
3. Install Webex Teams or go directly to the team space
4. Enter messages/questions in the team space

Webex Teams will be moderated by the speaker until June 18, 2018.



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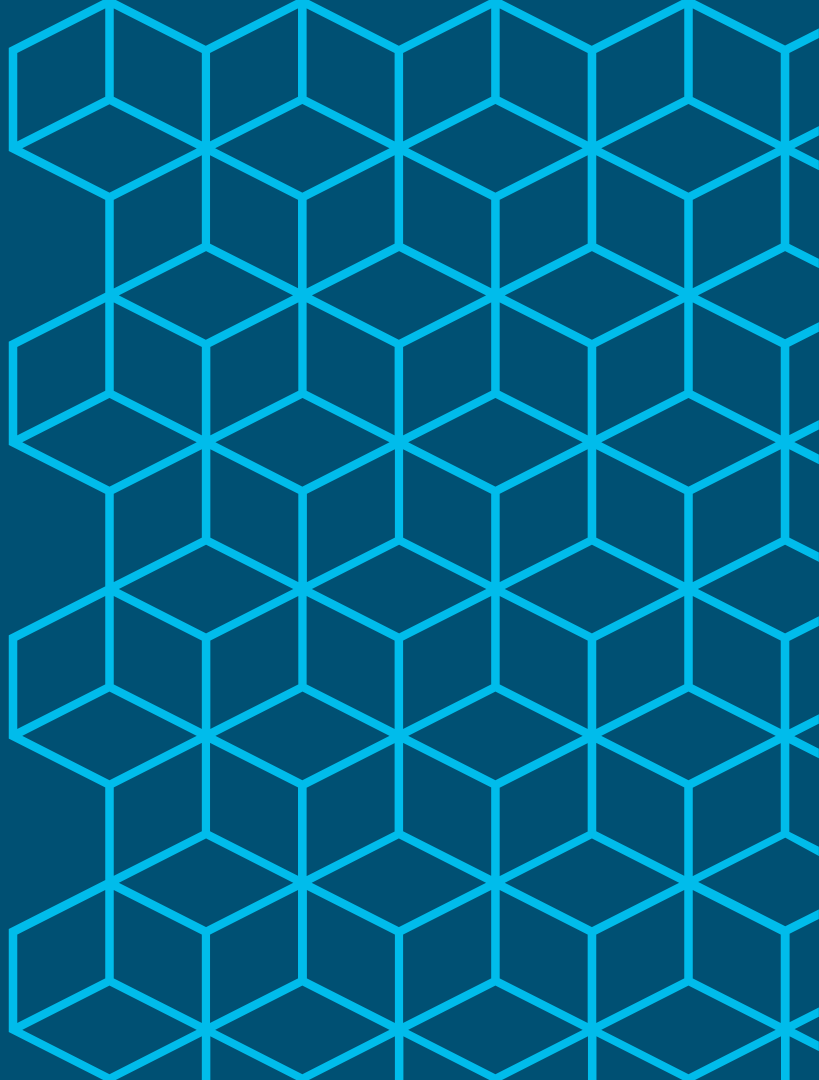
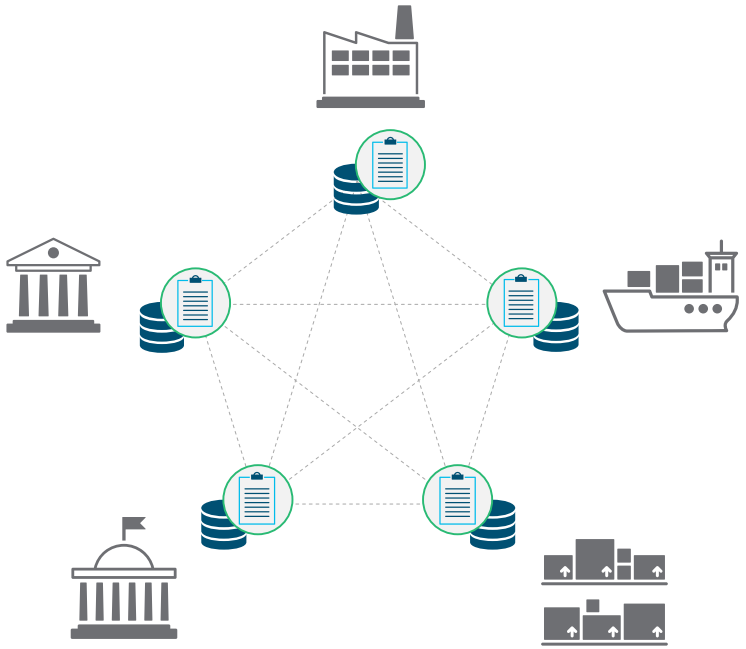
Introduction to Blockchain



What is Blockchain?

A shared digital ledger for recording transactions between participants

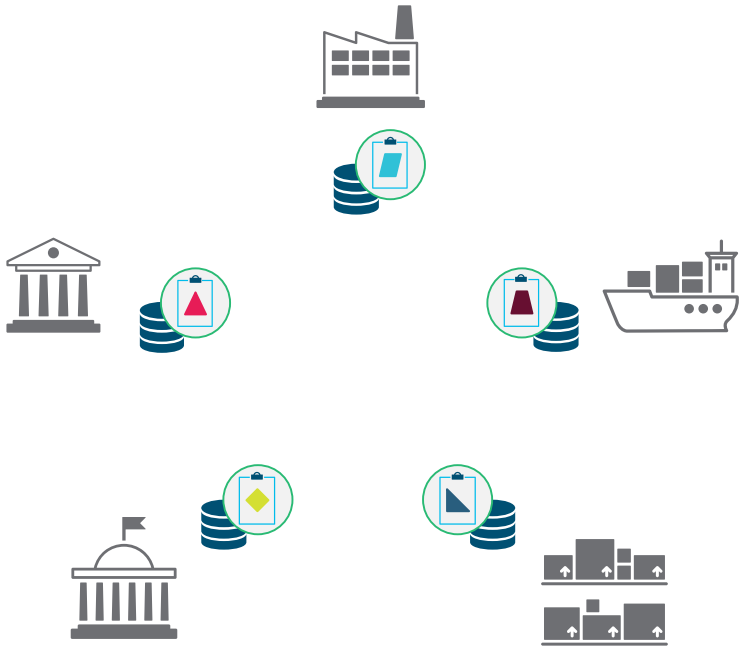
The history of transactions stored on the ledger cannot be altered



Why do we need it?

Often, participants maintain their own separate ledgers to keep a record of transactions such as orders, payments, etc.

Therefore, each participant has their own version of the truth – leading to errors, fraud, inefficiencies and dependence on intermediaries



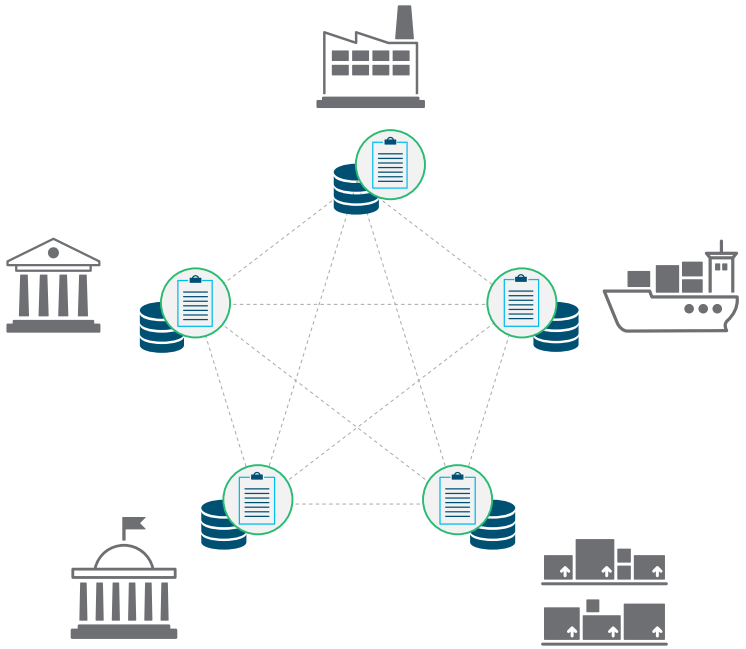
How does Blockchain help?

Shared ledger provides a single version of the truth for all participants

Transactions cannot be altered once recorded in the ledger

All participants must agree (reach consensus) before a new transaction is recorded in the ledger

Eliminates errors, fraud, the need for intermediaries and enables trustless transactions

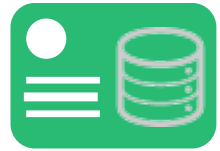


How does Blockchain Work?

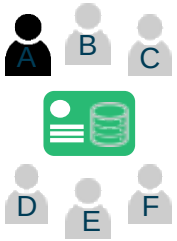
All updates to the distributed ledger are timestamped and grouped into a data structure called a 'block'

Multiple parties verify the validity of the block before it can be added to the ledger

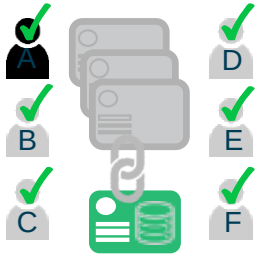
Party A has a new transaction to update the ledger



The transaction is added to a digital "block"



All parties in the network see the new block



Parties confirm the block is valid and it is added to the chain

Blockchain enables secure transactions across multiple parties

A distributed ledger that stores a record of all information exchanges between participants on a network

Enables trusted information exchange as all ledger entries are validated, auditable and tamper-proof

Decentralized structure eliminates need for central, certifying authority or intermediaries

Cryptography allows secure exchange of information across multiple parties without risk of breach

Blockchain offers key benefits to enterprises that can be leveraged for a broad range of applications

Single version of truth

All participants in a blockchain network have the same view of data, eliminating reconciliation typical with silo'ed databases

Disintermediation

Distributed network and data updates through consensus can eliminate third-party centralized intermediaries

Automation

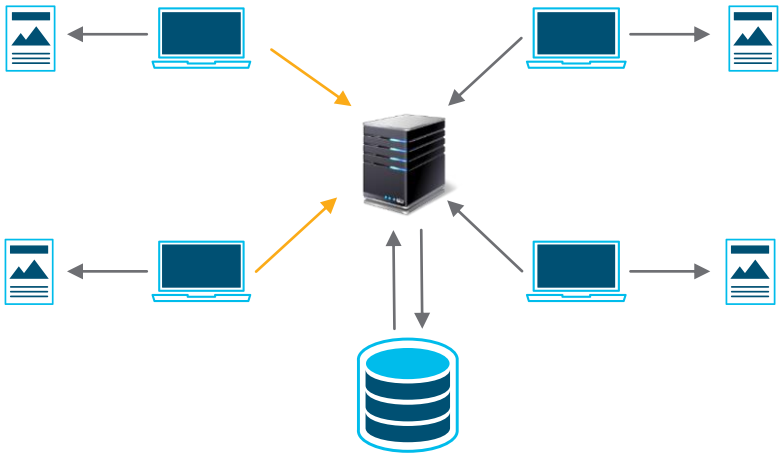
All shared data is validated, enabling automated impartial execution of coded contracts

Secure digital assets

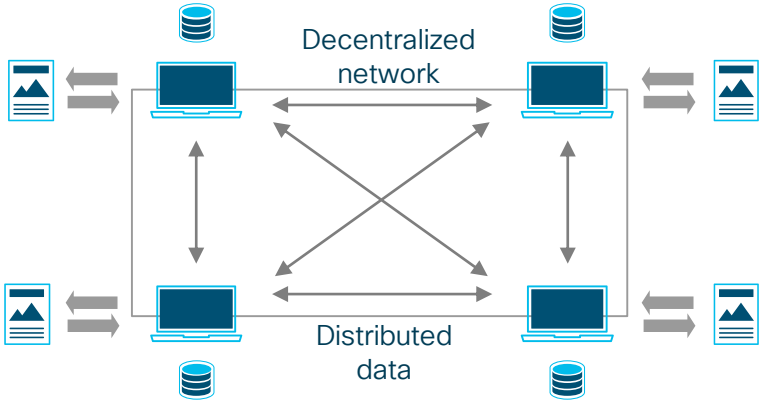
Cryptography enables secure ownership and transfer of digital assets such as currency, intellectual property, software, etc.

Blockchain is fundamentally different from a client/server solution

Centralized client/server architecture



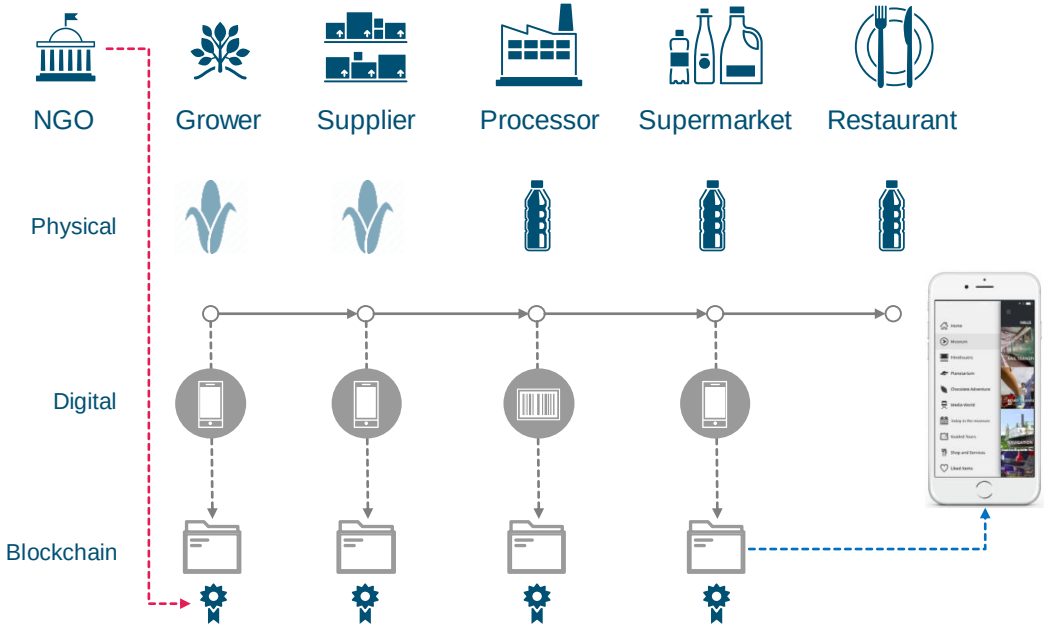
De-centralized blockchain architecture



Example for describing blockchain concepts

Using blockchain to track lifecycle of certified organic food from farm to table

- Movement of food through the supply chain is tracked digitally through smart tags and NFC
- Tamper-proof transaction records from each step are stored on the blockchain
- Lifecycle of food and organic certificates can be verified using app that reads from blockchain

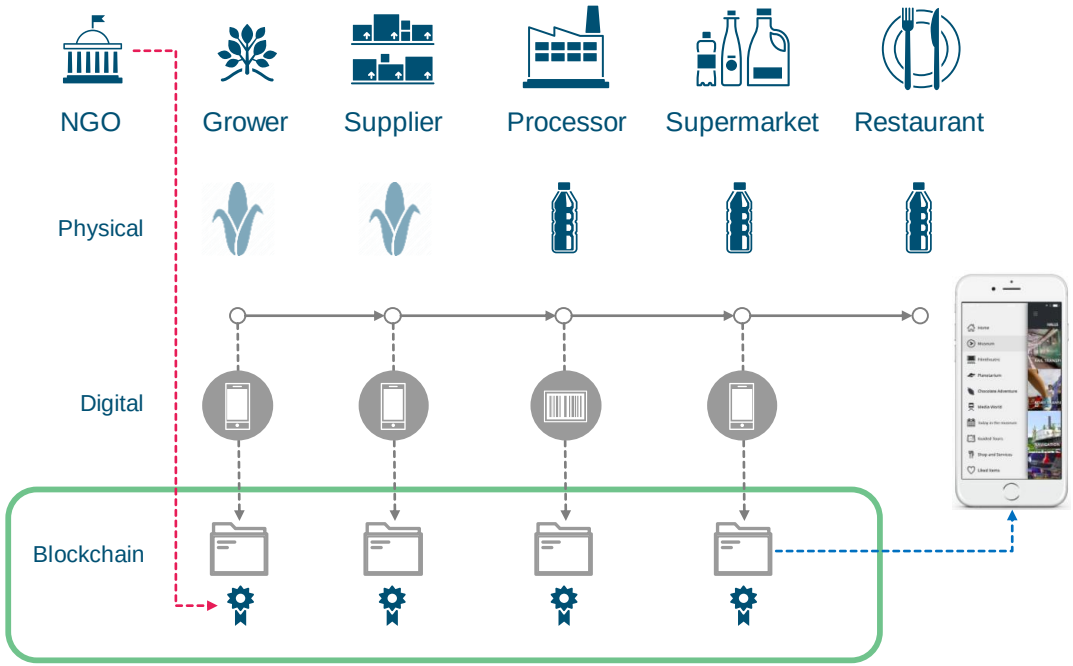


What is a blockchain platform?

Platform provides the tools and infrastructure to deploy a Blockchain network and build a Blockchain app

Core infrastructure in a blockchain platform can include:

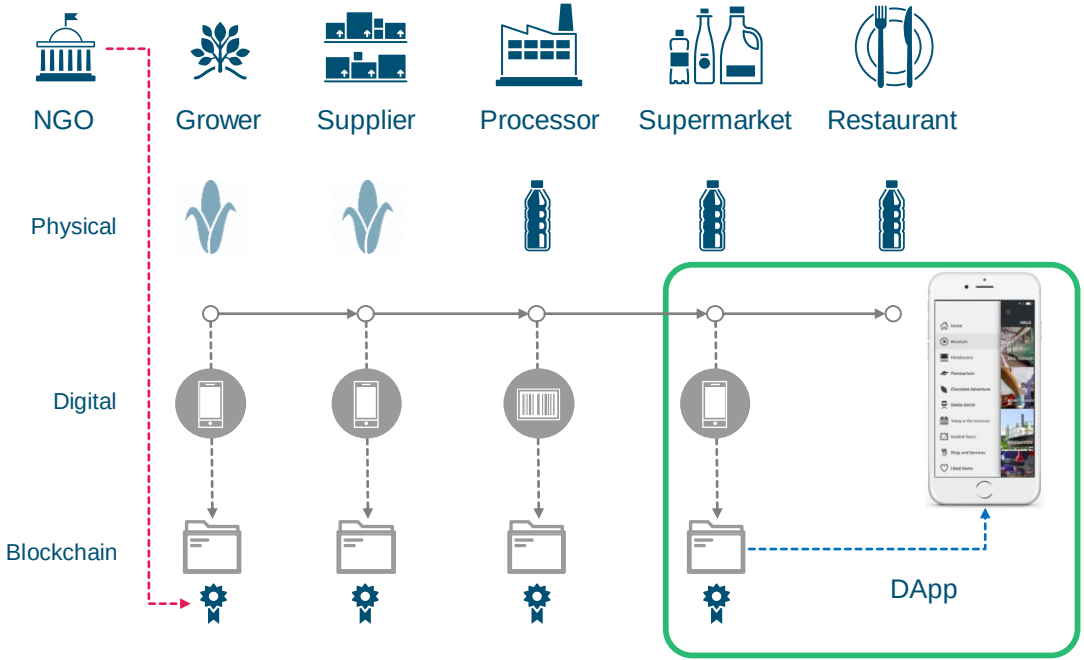
- Node deployment
- Consensus management
- Smart contract creation
- Transaction recording
- Security layers
- App development SDK



What is a Dapp ?

An app that has it's backend code and data running on a decentralized peer-to-peer network

- A DApp can be executed autonomously on any node in a blockchain network
- All data accessed by DApp is stored in a blockchain
- Not controlled by any one entity
- Cannot be manipulated / doesn't have single point of failure
- Provides the benefit of eliminating intermediaries

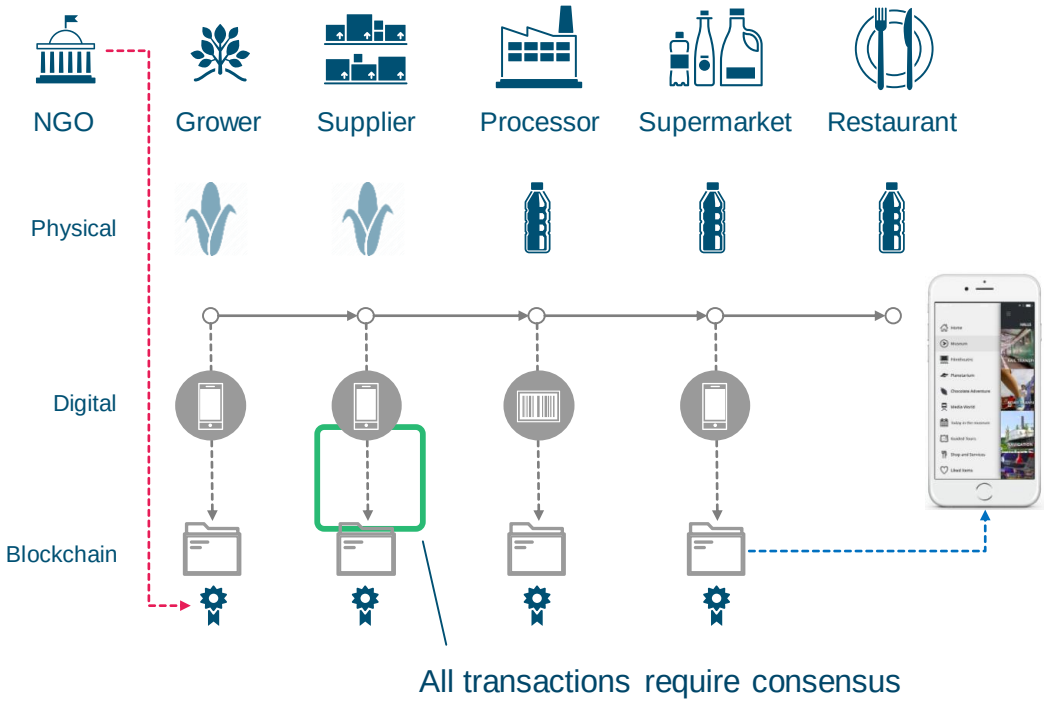


What is Consensus?

It's a protocol for parties on a blockchain to agree on the validity of transactions before recording them on the ledger

Common consensus protocols include:

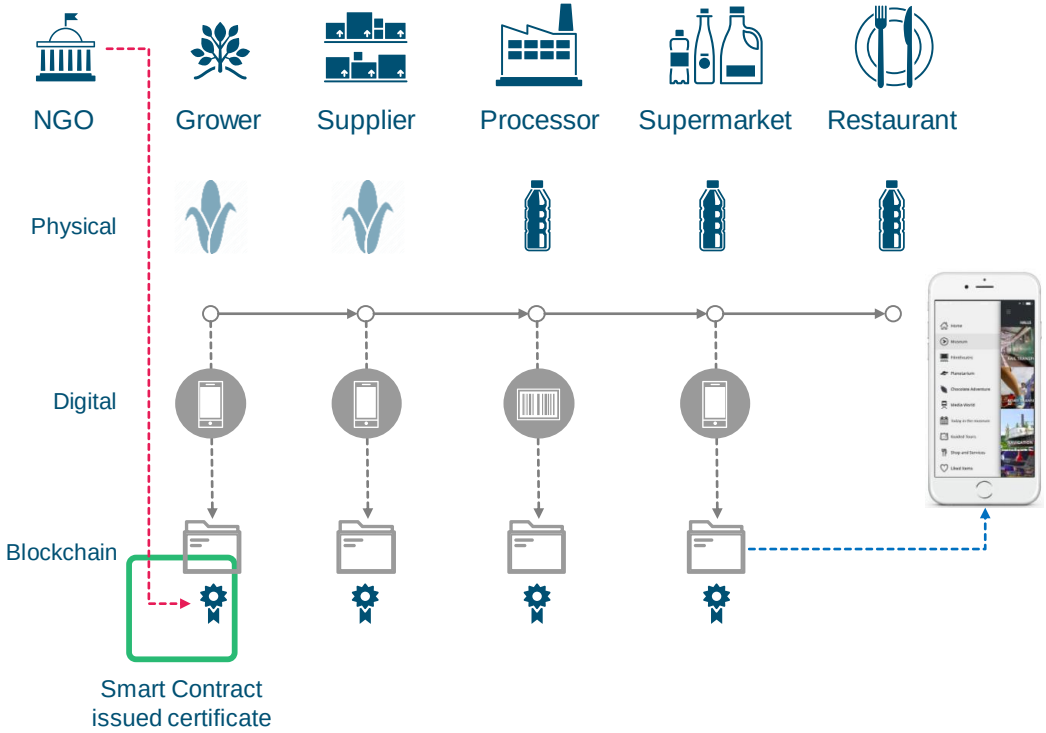
- Proof of Work requires participants to run complex computations to verify transactions in exchange for digital tokens
- Proof of Stake selects an individual participant to verify transactions based on their proportional stake in the network (e.g. number of tokens owned or smart contracts executed)



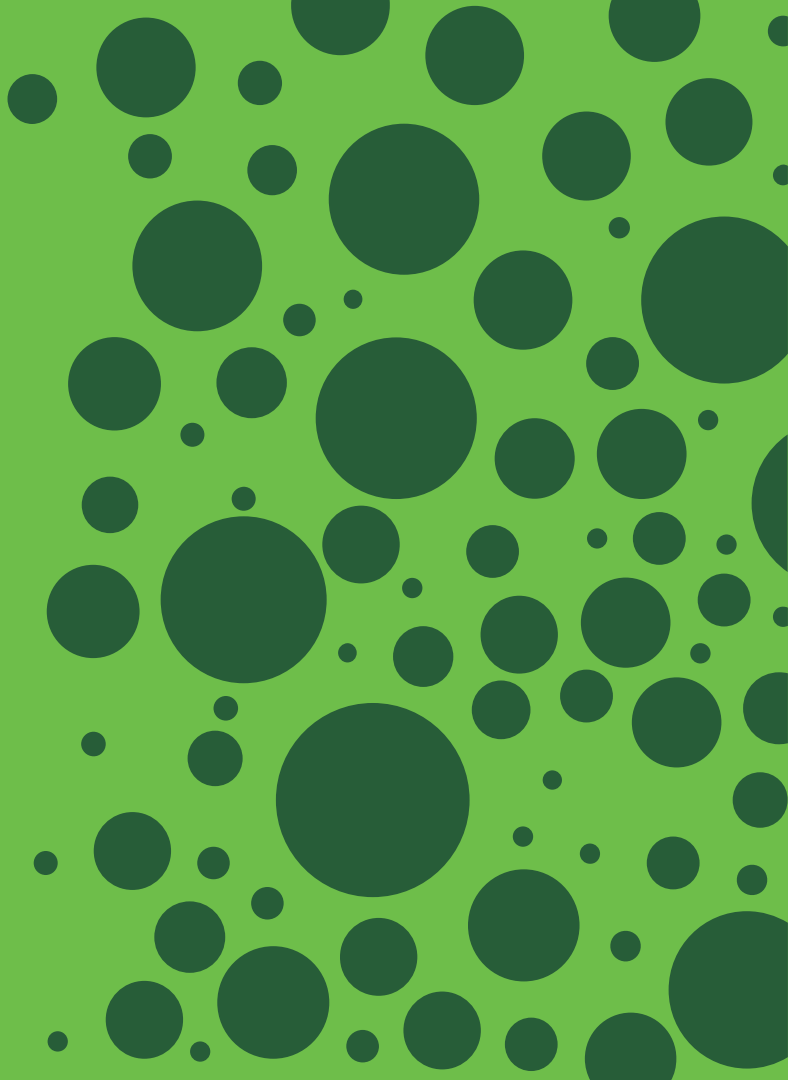
What is a Smart Contract?

A Smart Contract is code that is programmed to automatically execute on a decentralized network when certain trigger conditions or rules are met

- Guaranteed to execute exactly as written and cannot be overridden by any entity on the network
- Can be used to automate simple transactions such as authorizing payments or issuing certificates
- Ensures transparent impartial execution since trigger data is validated through consensus



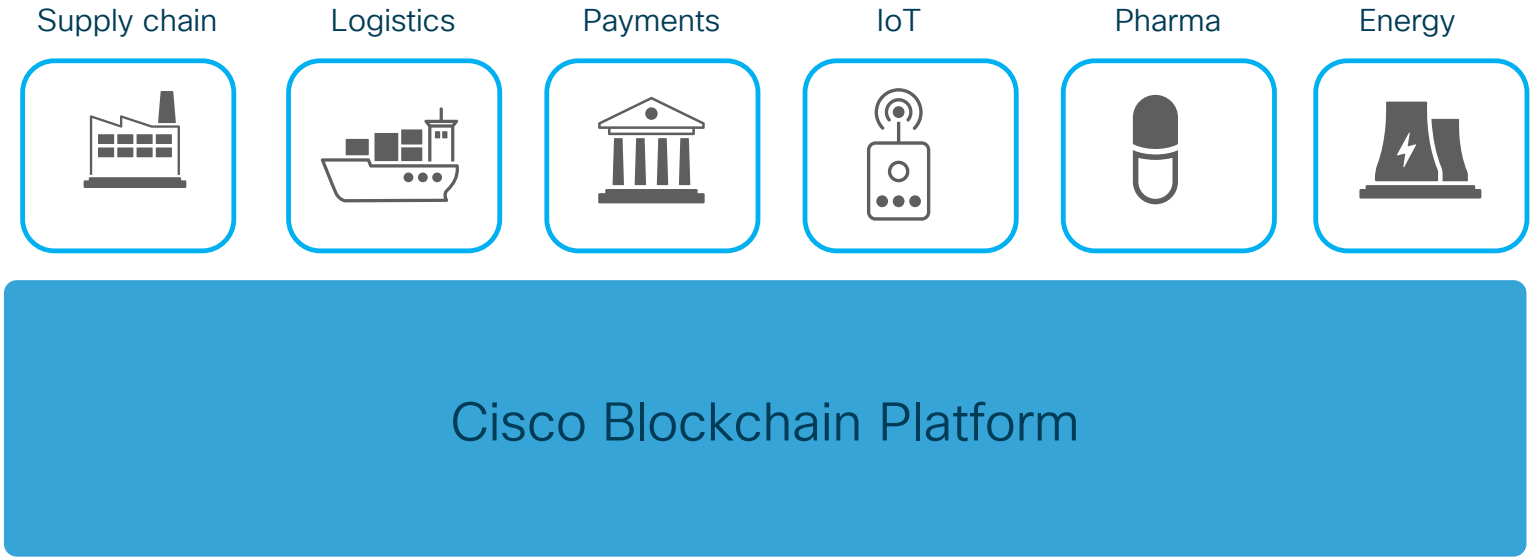
Deployment Models



Vision

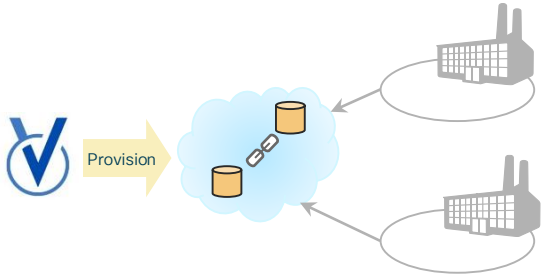
Internet-scale trust network

One Platform: Multiple Chains, Multiple Market Segments



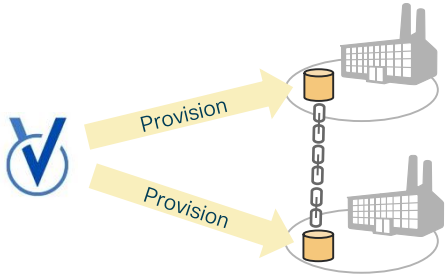
Deployment Models

PaaS hosted on cloud



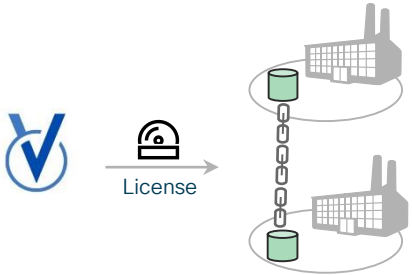
- Virtual nodes hosted by Cisco Blockchain on a cloud service
- Participants gain access and issue transactions through the cloud

PaaS hosted on premises



- 'Blockchain pods': Physical nodes provisioned by platform on premises
- Hardware infrastructure bought, installed and maintained by Cisco Blockchain Platform

Platform software license



- 'Do it yourself' model – customers provided a software subscription
- Customers deploy on their own datacenters or cloud infrastructure

Proposed billing approach: Billing relationship with single paying party

Cisco Blockchain Platform will provide tools and analytics to help customers determine allocation of charges to different network participants

Note: additional option of software bundled with hardware to be evaluated

Enterprise Needs

	Premium feature	Description
1	 Blockchain network monitoring and management	Monitoring performance for key platform modules including: • Smart contracts, consensus modules, ledger storage Monitoring performance of nodes, network of nodes and transactions
2	 Threat management and analytics	Analytics and management tools to enable: • Consensus security • Anomaly detection and preemption
3	 SLA management & assurance analytics	Analytics and management tools to enable: • SLA monitoring and assurance
4	 SLA management	SLAs for platform performance: • Ensure smart contract execution, transaction time and uptime to meet SLA requirements

Services

Service Offering			Offering Description
 Advisory	1	Solution design and architecture	• Use case design, readiness assessment, business case development, solution architecture and roadmap
 Implementation	2	Custom development	• Implementation services to develop custom applications based on customer specific needs
 Optimization	3	Solution optimization	• Services to Improve efficiency, performance, and productivity of deployed solutions
 Managed	4	Managed services	• Services to fully manage and maintain solutions deployed on-premises
 Technical	5	Technical support	• Customer support including break-fix, 24x7 premium support
 Training	6	Training and education	• Executive forums and workshops, live and on-demand training sessions, and modeling labs

Cisco on Cisco

Cisco Blockchain Platform
And a suite of supply chain apps

CISCO BLOCKCHAIN PLATFORM

Enterprise grade blockchain platform

Designed by developers with the enterprise in mind

Leverages Cisco strengths in networking, security & performance

FOOTPRINT

User-facing app for counterfeit detection

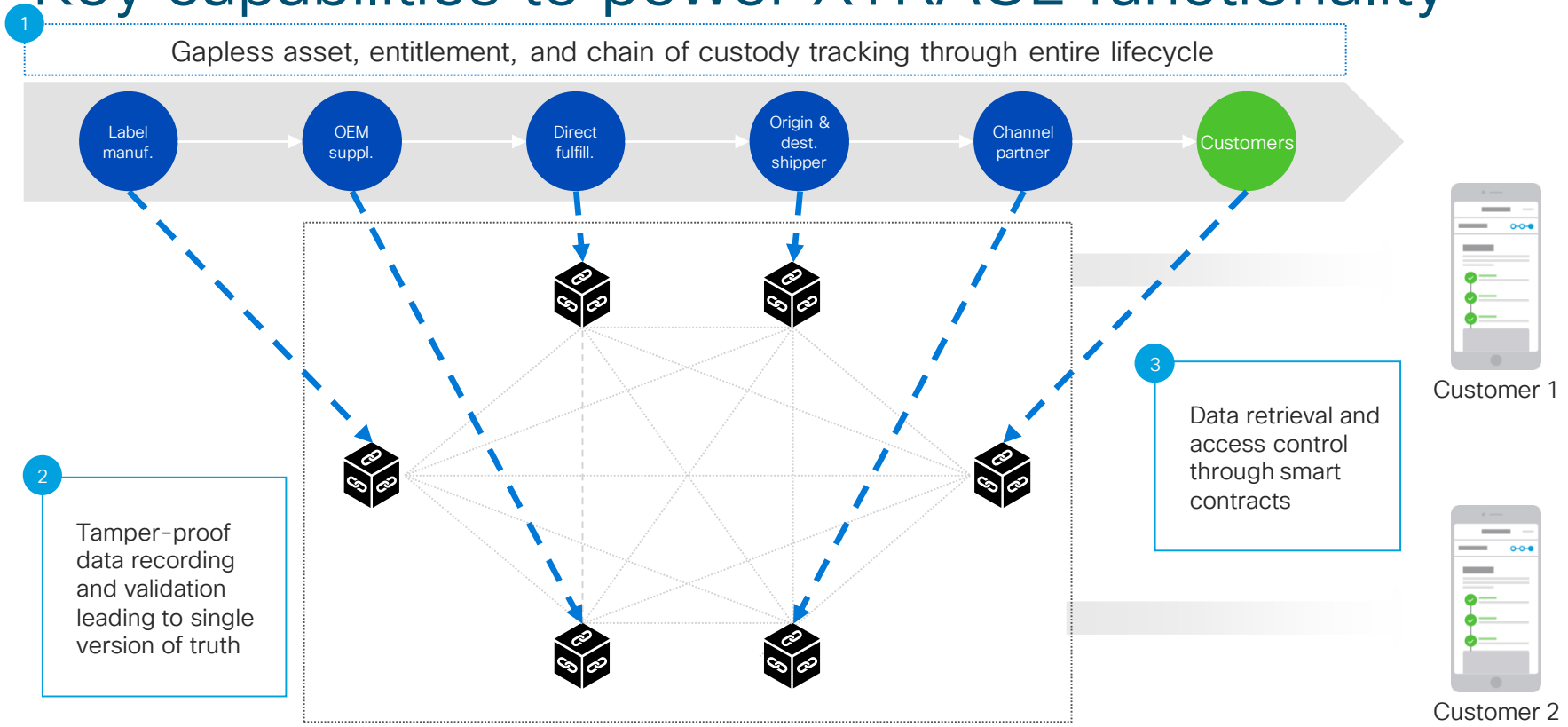
Instant product authentication

XTRACE

Track and trace integration layer for supply chains

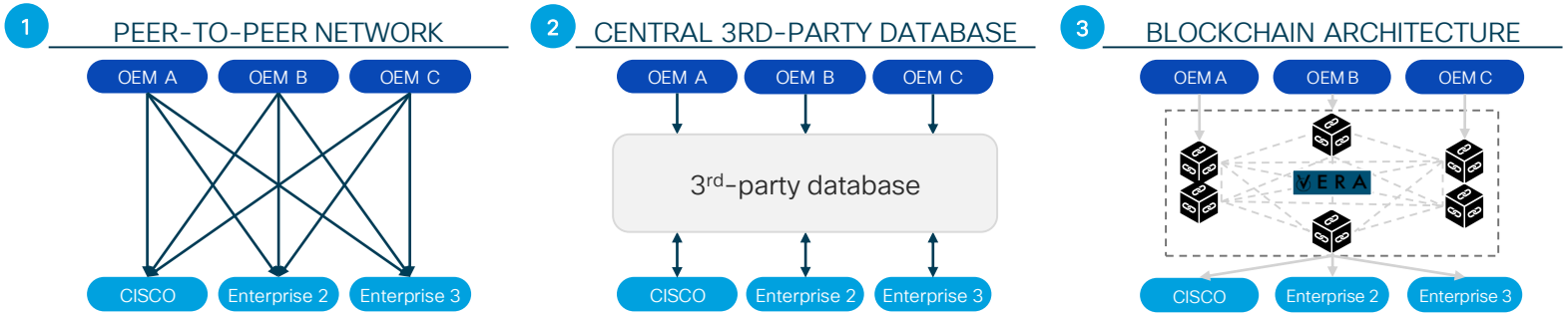
Provides end to end supply chain visibility

Key capabilities to power XTRACE functionality



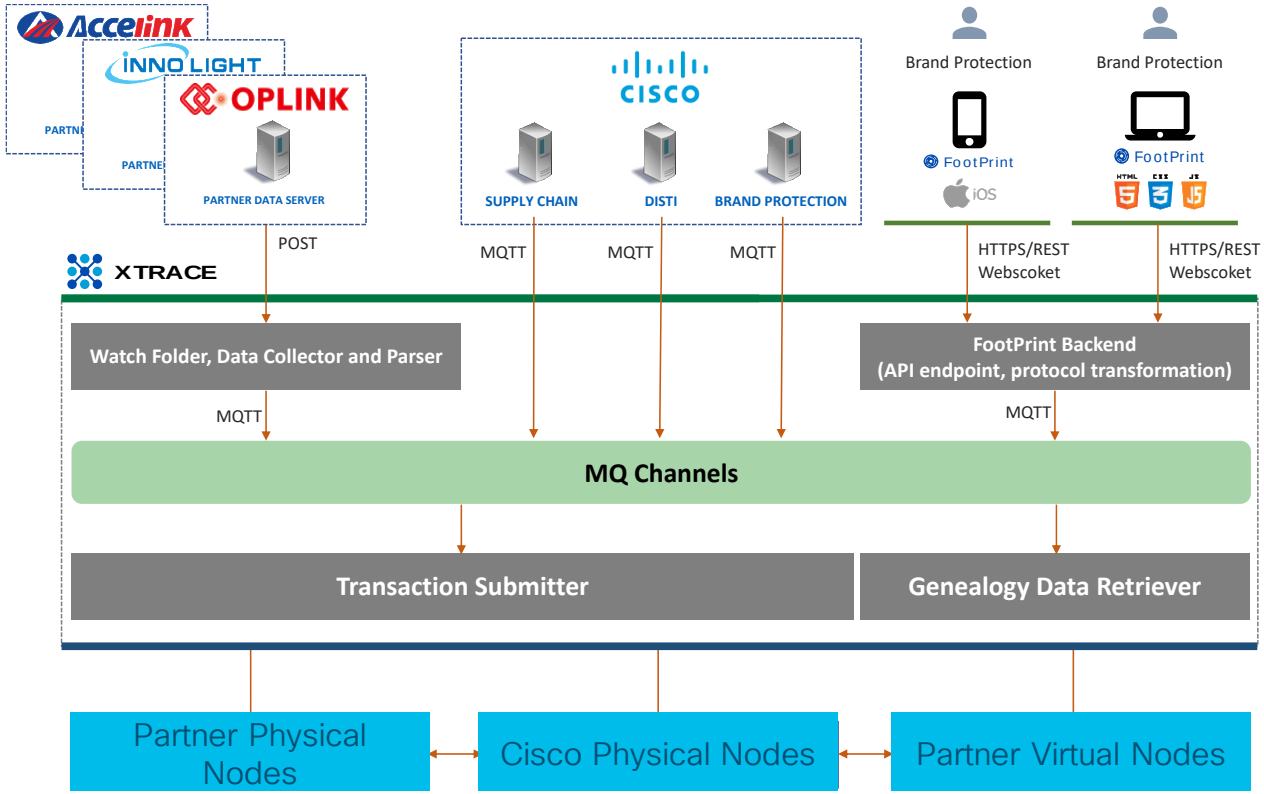
1. For example: Legal transfer of ownership of goods across supply chain participants; Validate credentials of blockchain participants to grant permissions to selective data; Enforce certain terms and conditions of supplier contracts

Why blockchain?
A superior architecture for scaling trust

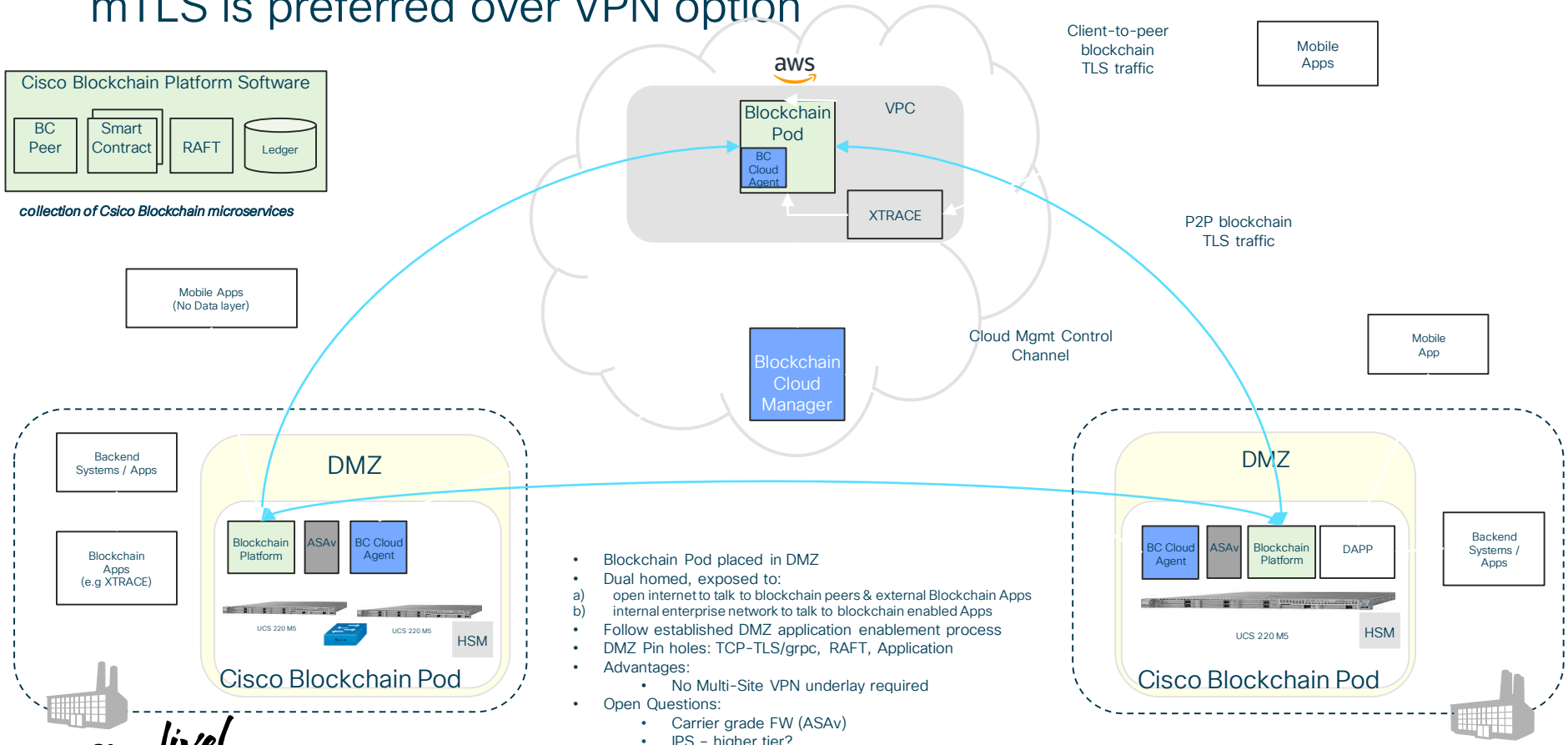


	1 PEER-TO-PEER NETWORK	2 CENTRAL 3RD-PARTY DATABASE	3 BLOCKCHAIN ARCHITECTURE
Advantages	✓ Simple to implement – direct B2B messages effective at small scale	✓ Improved scalability; 3rd party handles msg translation, deliv. ✓ Better chance to enforce standards	✓ Foundation for scale: future benefits such as virtual assets ✓ No single intermediary to trust ✓ Single version of truth ✓ Can run smart contracts ✓ Higher resiliency ✓ Strong network effects
Potential drawbacks	! Scales poorly; high monitoring and maintenance costs ! High levels of customization among / between participants ! Higher recurring costs	! Single point of failure ! All parties must trust 3rd party ! 3rd party is high value target of cyberattack ! Long cycles to push updates ! Higher recurring costs	! Low understanding of tech ! Difficult to start without strong existing market position ! Investment in standards required ahead of time

Deployment Architecture



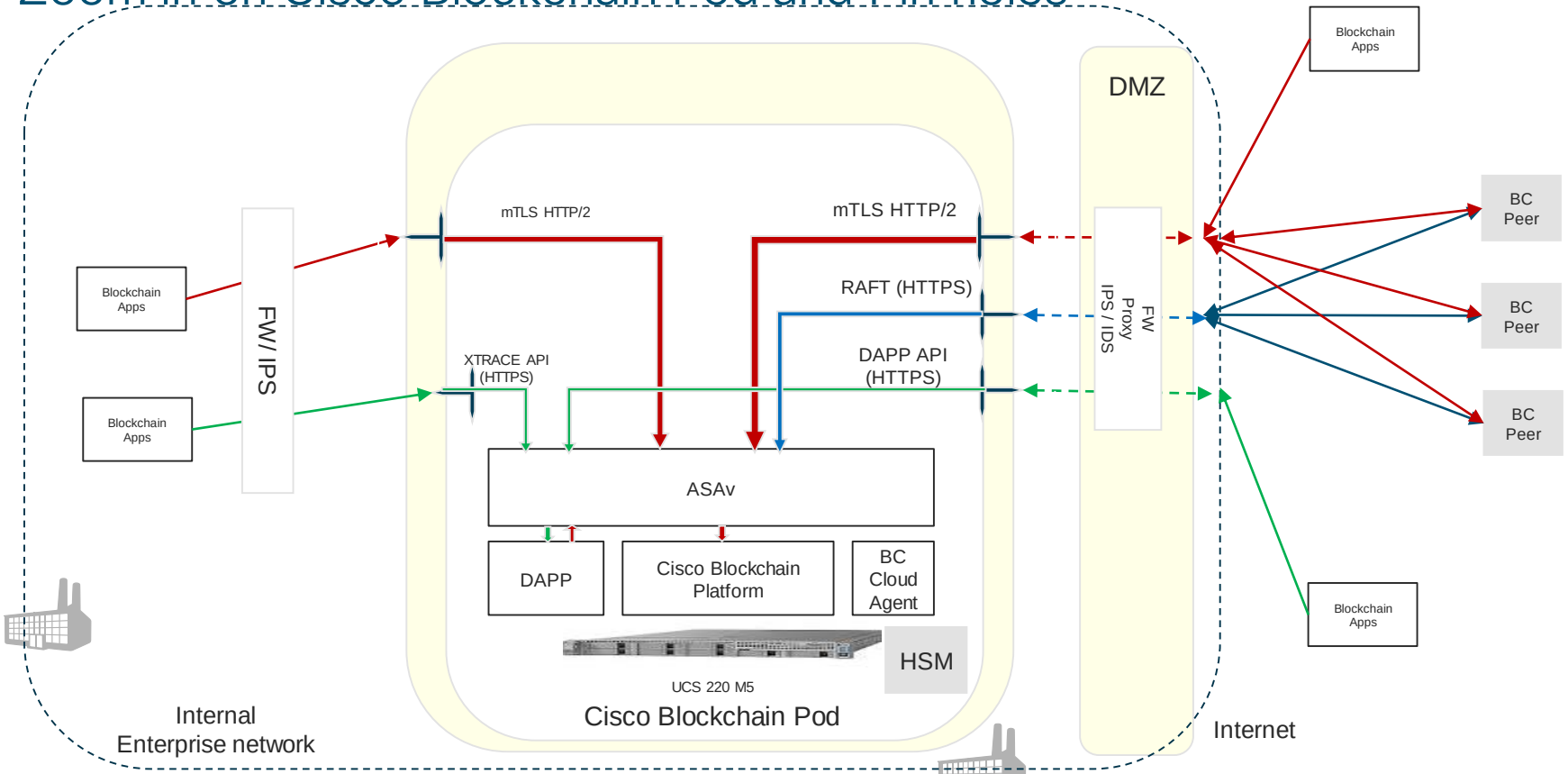
Blockchain Network Architecture
mTLS is preferred over VPN option



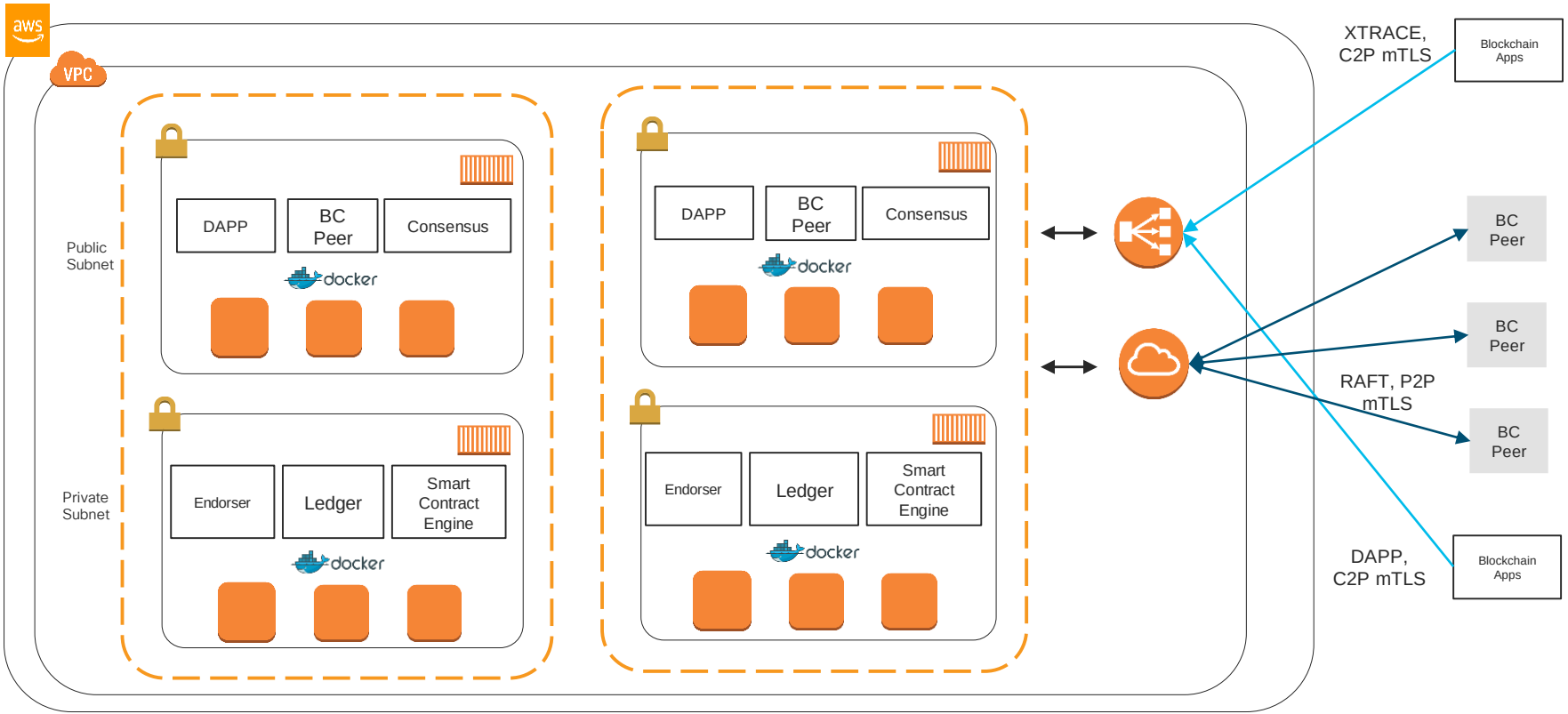
- Blockchain Pod placed in DMZ
- Dual homed, exposed to:
  a) open internet to talk to blockchain peers & external Blockchain Apps
  b) internal enterprise network to talk to blockchain enabled Apps
- Follow established DMZ application enablement process
- DMZ Pin holes: TCP-TLS/grpc, RAFT, Application
- Advantages:
  - No Multi-Site VPN underlay required
- Open Questions:
  - Carrier grade FW (ASAv)
  - IPS – higher tier?

Blockchain Network Architecture

Zoom in on Cisco Blockchain Pod and Pin holes



Blockchain Network Architecture
AWS Node



Opportunities

Gaps

Hardened Security

Information Security

- Key Management – SW and HW
- Secured evolution environment
- Cyber security – threat management

Information Privacy and Confidentiality

- RBAC
- Transaction Confidentiality

Blockchain trust and reputation

- Anomaly detection
- Collusion detection, management
- Continuous trust/reputation evaluation

Governance and policy management

Scalable Consensus

- High Speed transaction support
- High throughput
- Fully decentralized

Accelerated Adoption

- Familiar language(s)
- IDE with enhanced toolkit
- Documentation & code samples
- Network bootstrapping
- Developer community
- Works out of the box (e.g. BaaS)
- Professional Services

Performance Management

- Performance monitoring
- Access limit and throttling
- Activity logs and auditing
- Infrastructure auto scaling
- Workload distribution (edge/fog computing)
- QOS/SLAs

Flexible Framework

- Configurable stack
- Infrastructure compatibility
- Chain interoperability
- Multi protocol interoperability

Leading technology: Cutting-edge features for unmet needs

Fully decentralized permissioned network

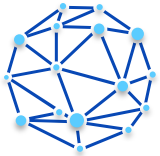
Truly decentralized consensus protocol to enable **trusted multi-enterprise** business networks

Fine grained information confidentiality

Full **control** over access **permissions** to protect **data privacy** in a network with multiple participants

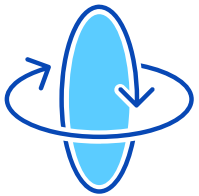
Predictive threat analytics and collusion control

AI based algorithms to **detect malicious behavior** and **protect** your network from **cyber threats**



1000s of transactions per second at internet scale

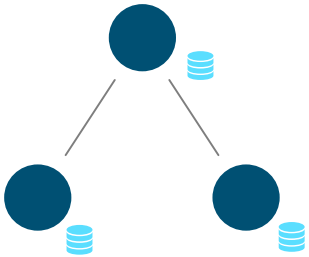
Off-chain data storage and jurisdiction based data replication enable **high scalability** and **throughput**



Flexible framework to compose use case optimized stack

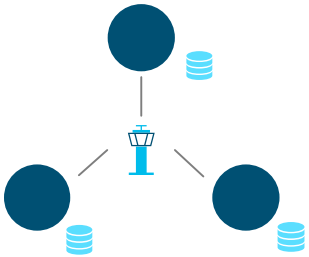
Modular design to support plugins for **customized** components to **optimize** blockchain based on **use cases**

Blockchain is an alternative to traditional supply chain IT solutions such as EDI and control towers



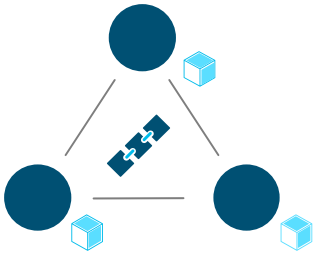
Electronic data interface (EDI)

- Point-to-point integration between two parties
- Exchange is often done between ERP systems and in batches
- Limited traceability and no single version of the truth
- Only point to point automation and hard to maintain



Supply chain control tower

- Centralized (typically cloud) solution to which the supply chain participants integrate
- Provides visibility and automation capabilities
- Requires third party intermediary to host data – no shared ownership
- Single point of failure



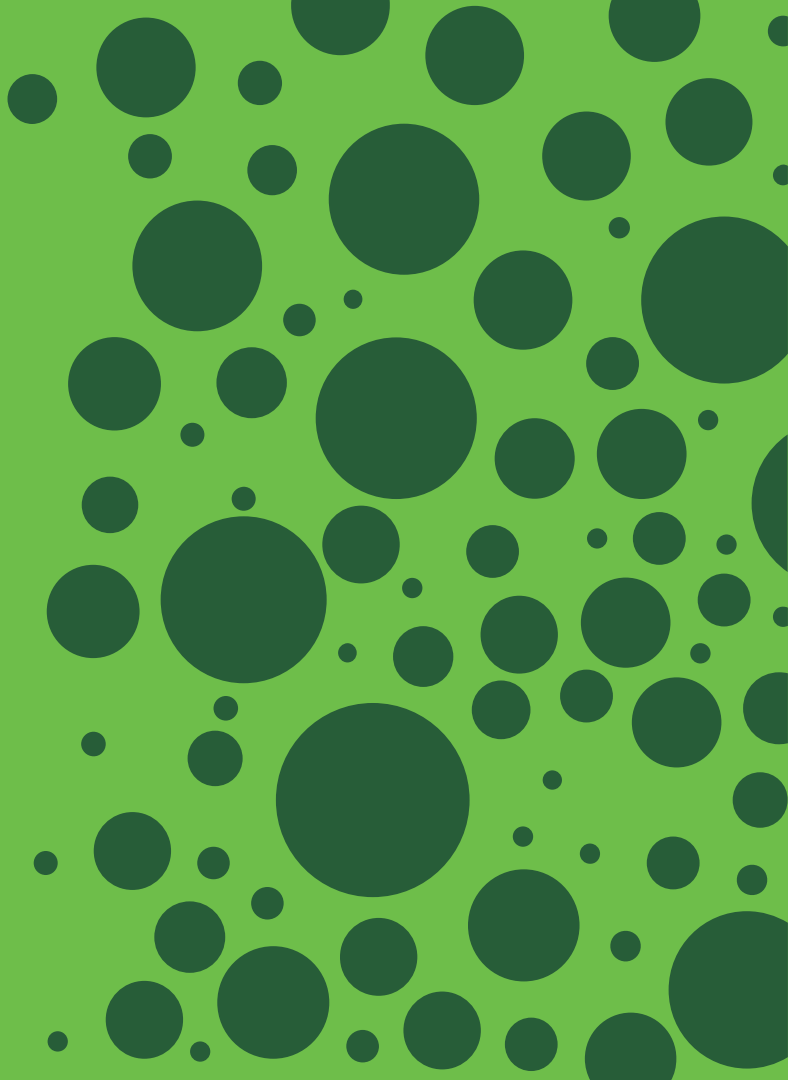
Blockchain network

- Decentralized system where supply chain participants can access/update a shared ledger
- Smart contracts provide automation capabilities based on single version of the truth
- Shared ownership and control of data, no single point of failure

How Existing Cisco Products Can Fit In

Category		Product	Key features to complement Cisco Blockchain solution
Software	1	Cisco Enterprise Network Security	Suite of enterprise security products including: • Cloud security • Threat protection • Policy and access
	2	APPDYNAMICS	Full stack end-user application performance monitoring and management for: • Application back-end • Client • Legacy back-end
	3	DNA Center	• Network analytics to monitor network health
	4	DNA Assurance	• Network assurance and identification of performance issues
HW	5	Data center hardware[1]	· Compute, networking and security infrastructure

Collaboration



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Enterprise Ethereum Alliance

Trusted IoT Alliance

Chamber of Digital Commerce

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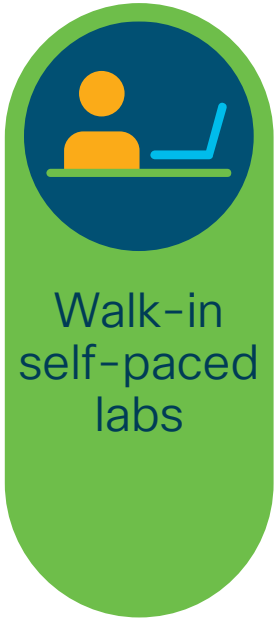

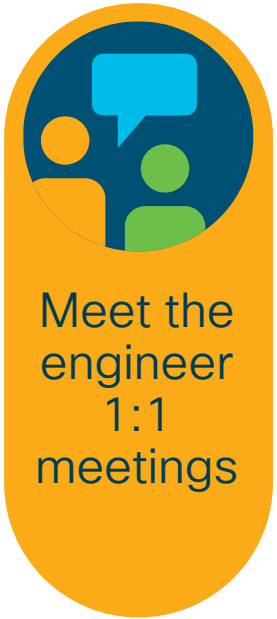

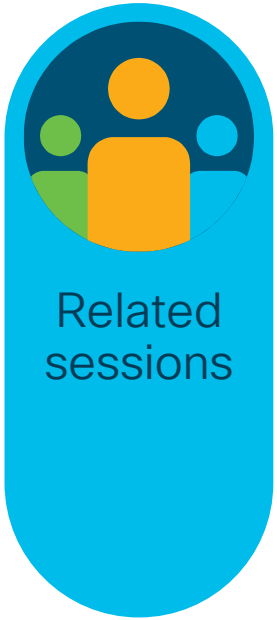

Thank you

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