Deploying Enterprise Blockchains

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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.
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.
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 its 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 a Dapp?
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).

All transactions require consensus.
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
One Platform: Multiple Chains, Multiple Market Segments

Supply chain  Logistics  Payments  IoT  Pharma  Energy

Cisco Blockchain Platform
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

<table>
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<tr>
<th>Premium feature</th>
<th>Description</th>
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| **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

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<th>#</th>
<th>Offering Description</th>
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| 1 | Advisory  
Solution design and architecture  
- Use case design, readiness assessment, business case development, solution architecture and roadmap |
| 2 | Implementation  
Custom development  
- Implementation services to develop custom applications based on customer specific needs |
| 3 | Optimization  
Solution optimization  
- Services to Improve efficiency, performance, and productivity of deployed solutions |
| 4 | Managed services  
- Services to fully manage and maintain solutions deployed on-premises |
| 5 | Technical support  
- Customer support including break-fix, 24x7 premium support |
| 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

CISCO BLOCKCHAIN PLATFORM

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

2. Tamper-proof data recording and validation leading to single version of truth

3. Data retrieval and access control through smart contracts
Why blockchain?
A superior architecture for scaling trust

1. PEER-TO-PEER NETWORK
   - OEM A
   - OEM B
   - OEM C
   - CISCO
   - Enterprise 2
   - Enterprise 3

2. CENTRAL 3RD-PARTY DATABASE
   - OEM A
   - OEM B
   - OEM C
   - 3rd-party database
   - CISCO
   - Enterprise 2
   - Enterprise 3

3. BLOCKCHAIN ARCHITECTURE
   - OEM A
   - OEM B
   - OEM C
   - V E R A
   - CISCO
   - Enterprise 2
   - Enterprise 3

### 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

#CLUS
Deployment Architecture

MQ Channels

Watch Folder, Data Collector and Parser

Partner Physical Nodes → Cisco Physical Nodes → Partner Virtual Nodes

Transaction Submitter

Genealogy Data Retriever

MQTT

FootPrint Backend (API endpoint, protocol transformation)

HTTPS/REST Websocket

Brand Protection

Partner Physical Nodes

Cisco Physical Nodes

Partner Virtual Nodes

MQTT

MQTT

MQTT

HTTP/REST Websocket

MQTT

HTTP/REST Websocket
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
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

**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

**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
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

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<tr>
<th>Category</th>
<th>Product</th>
<th>Key features to complement Cisco Blockchain solution</th>
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| Software       | Cisco Enterprise Network Security | Suite of enterprise security products including:  
|                |                             |   • Cloud security  
|                |                             |   • Threat protection  
|                |                             |   • Policy and access  
|                | APP DYNAMICS                | Full stack end-user application performance monitoring and management for:  
|                |                             |   • Application back-end  
|                |                             |   • Client  
|                |                             |   • Legacy back-end  
|                | DNA Center                  | • Network analytics to monitor network health  
|                | DNA Assurance               | • Network assurance and identification of performance issues  
|                | Data center hardware¹       | • Compute, networking and security infrastructure  

¹ Data center hardware includes components such as servers, storage systems, and network devices.
Collaboration
Signup and Get Involved

Hyperledger

Enterprise Ethereum Alliance

Trusted IoT Alliance

Chamber of Digital Commerce
Complete your online session evaluation

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- Meet the engineer 1:1 meetings
- Related sessions
Thank you