



Inform[ED] Webinar

Links in the Chain: CableLabs' Primer on What's Happening in Blockchain

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CableLabs Inform[ED] Webinar

AGENDA

- What's happened in the blockchain space over this last year: community, standards, & applications
- Q&A
- Upcoming CableLabs Events



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Blockchain Matures

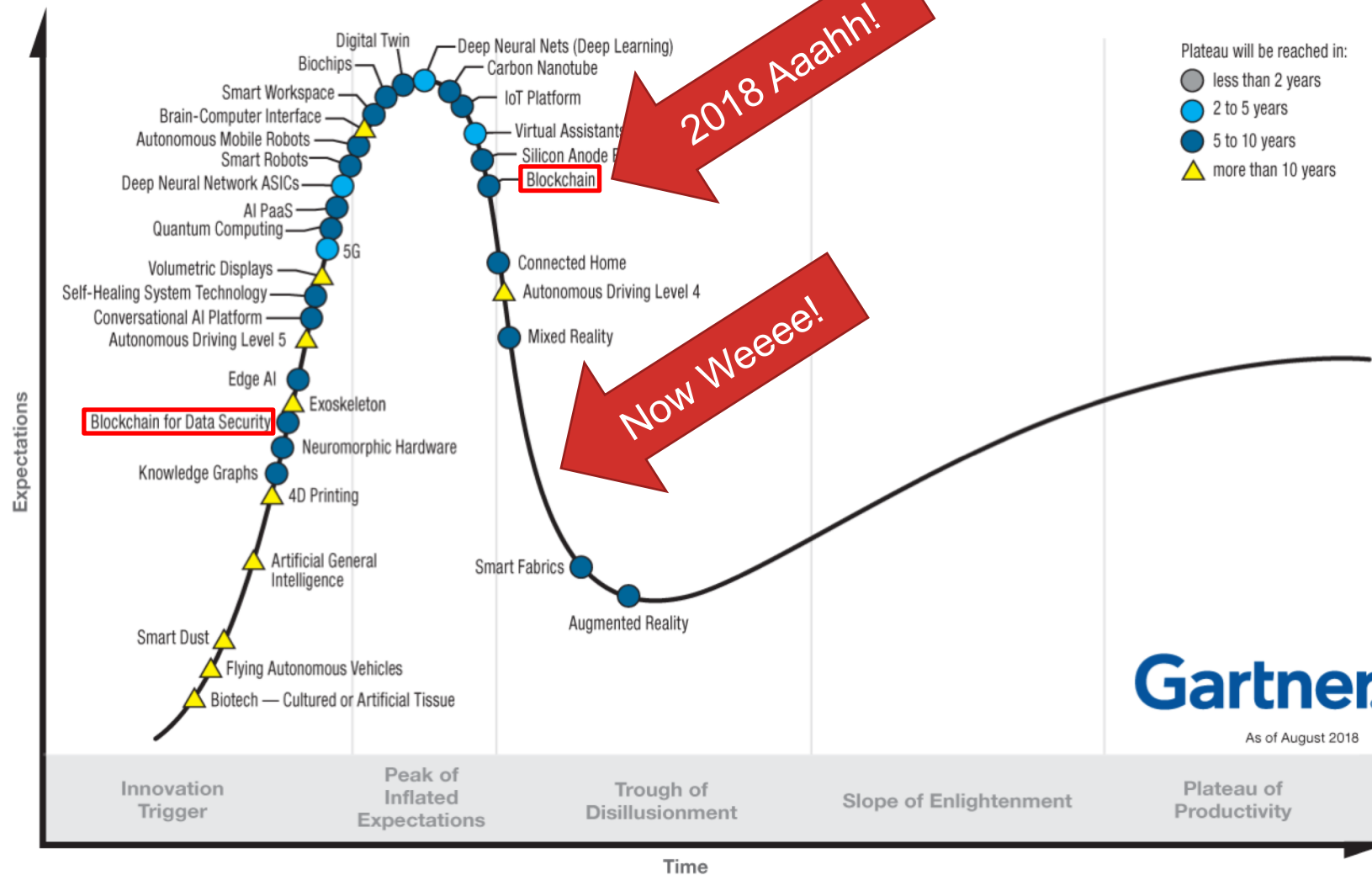
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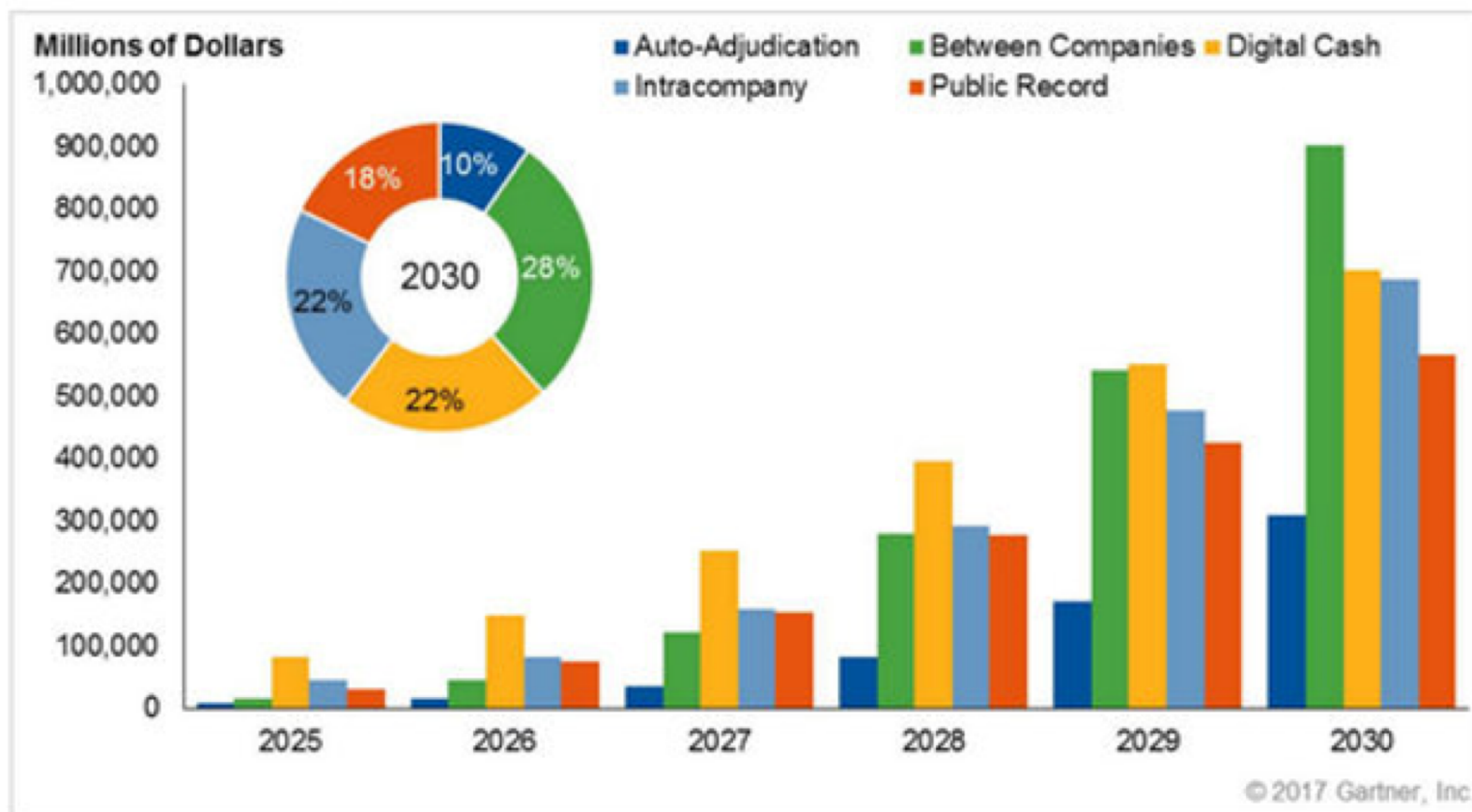
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Why Do We Care About Blockchain Technologies? INFORMED™

Hype Cycle for Emerging Technologies, 2018



Business value-add of Blockchain - \$176 billion by 2025, \$3.1 trillion by 2030



Source: Forecast: Blockchain Business Value, Worldwide, 2017-2030

Gartner

Enterprise Ethereum Alliance

Current Special Interest Groups (more are being planned)

- Advertising and Media
- A.I. & Blockchain
- Chemical
- Education and Research
- Energy
- Financial Services
- Healthcare
- Real Estate
- Security
- Supply Chain
- Telecommunications

Technical Specification Working Group and Task Forces

- Digital ID Task Force
- Trusted Execution Task Force
- Testing Working Group
- BFT Task Force
- Cross-Chain Interoperability Task Force

Certification Working Group: Starting in 2020

Hyperledger

Working Groups

- Architecture
- Identity
- Performance and Scale
- Technical – China
- Learning Materials Development
- Smart Contracts
- Diversity, Civility, Inclusion

Special Interest Groups

- Healthcare
- Public Sector
- Social Impact
- Telecom
- Trade Finance
- Supply Chain
- Education Architecture
- Capital Markets

IEEE Blockchain Initiative Activities:

blockchain.ieee.org

Conferences

- IEEE BC Global Summit @ NIST Q3 2018
- IEEE BC Global Summit (China Q4? 2019)
- IEEE BC International Conference (USA Q3 2019)
- IEEE BC Technical Workshops (3) 2019
- IEEE BC EU Workshop Q4 2019

Industry/Special Projects

- Transactive Energy & BC
- Pharma & BC
- Clinical Trials & BC
- Supply Chain Mgt & BC
- Healthcare & BC

Publications

- Whitepapers
- IEEE Blockchain Technical Briefs

Community Development

- Local Groups
- Entrepreneurs, Small Biz and Industry

Standards/Pre Standards

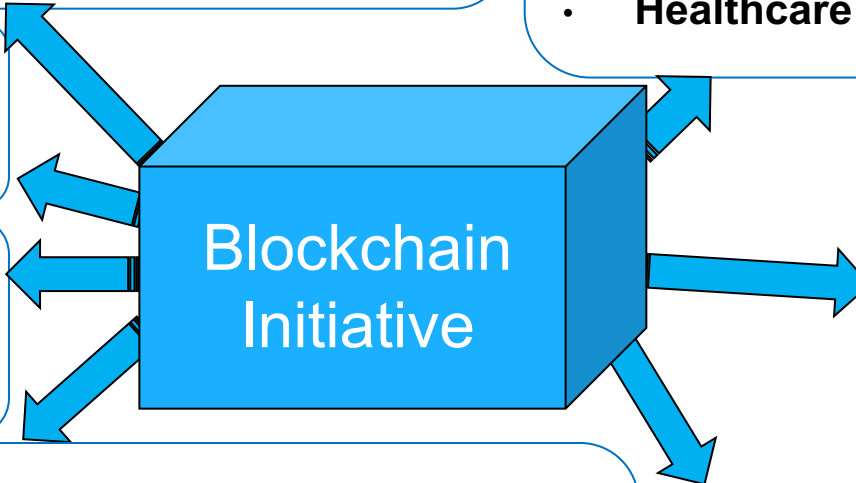
- Long Active Working Groups: P825, P2418.1, P2418.2
- New Working Groups: P2418.3, P2418.4, P2418.5, P2418.6, P2418.7, P2418.8
- Industry Connections: IC17-002-01, IC17-017-01, & IC17-012-01

Education

- eLearning modules
- Continuing education
- Webinars
- Podcasts

Web Portal

- Dedicated website
- Social media
- Video
- Articles



IEEE Blockchain Standards Working Groups

- Established

- IEEE P825: Transactive Energy
Type of Ballot: Individual
Start Date: Dec 2016
<https://standards.ieee.org/develop/project/825.html>
- IEEE P2418.1: Standard for the Framework of Blockchain Use in Internet of Things (IoT)
Type of Ballot: Entity
Start Date: June 2017
<http://sites.ieee.org/sagroups-2418/>
- IEEE P2418.2: Standard Data Format for Blockchain Systems
Type of Ballot: Entity
Start Date: July 2018

- Newer

- IEEE P2418.3: Standard for the Framework of Distributed Ledger Technology (DLT) Use in Agriculture
Start Date: July 2018
- IEEE P2418.4: Standard for the Framework of Distributed Ledger Technology (DLT) Use in Connected and Autonomous Vehicles (CAVs)
Start Date: July 2018
- IEEE P2418.5: Standard for Blockchain in Energy
Start Date: Sept 2018
- IEEE P2418.6: Standard for the Framework of Distributed Ledger Technology (DLT) Use in Healthcare and the Life and Social Sciences
Start Date: Sept 2018
- IEEE P2418.7: Standard for Blockchain Use in Supply Chain Finance
Start Date: Dec 2018
- IEEE P2418.8: Standard for Blockchain Applications in Governments
Start Date: Feb 2019

And if that wasn't enough...

P2418.X Series (Continued)

P2418.8 Standard for Blockchain Use in Government Affairs

P2418.9 Standard for Cryptocurrency Based Security Tokens

P2418.10 Standard for Blockchain in Digital Asset Management

P2140.X Series

P2140.1 Standard for General Requirements for Cryptocurrency Exchanges

P2140.2 Standard for Security Management for Customer Cryptographic Assets on Cryptocurrency Exchanges

P2140.3 Standard for User Identification and Anti-Money Laundering on Cryptocurrency Exchanges

P2140.4 Standard for Distributed/Decentralized Exchange Framework

P2140.5 Standard for Custodian Framework of Cryptocurrency

P2143.X Series

PAR P2143.1 Standard for General Process of Cryptocurrency Payment

PAR P2143.2 Standard for Performance Metrics of Cryptocurrency Payment

PAR P2143.3 Standard for Risk Control Requirements for Cryptocurrency Payment

P2144.X Series

PAR P2144.1 Standard for Framework of Blockchain-based IoT Data Management

PAR P2144.2 Standard for Functional Requirements in Blockchain-based IoT Data Management

PAR P2144.3 Standard for Assessment of Blockchain-based IoT Data Management

Others

PAR P2142.1 Recommended Practice for E-Invoice Business Using Blockchain Technology

PAR P2141.1 Standard for Using Blockchain Against Corruption in Centralized Organizations

IEEE Blockchain Pre-Standards & Standards Projects

IC Goal: Establish viability and create documentation for PARs (Standards Working Group).

- IC17-002-01: Digital Inclusion through **Trust & Agency (DITA)**
Type of Ballot: Individual
http://standards.ieee.org/develop/indconn/digital_inclusion/
- IC17-017-01: **Blockchain Asset Management**
Type of Ballot: Entity
Start Date: Dec 2017
- IC17-012-01: **Supply Chain & Trials Standardized Technology and Implementation**
Type of Ballot: Entity
Start Date: Sept 2017

Work Streams in IC17-012-01:

- **Smart Contracts** for Informed Electronic Consent in Clinical Trials (Adama Ibrahim, Biogen)
- **Health Quality Data Scoring System** Combined with Standard framework for Streaming Patient Data into the Blockchain and Linking to Patient Identity (Daniel Hwang)
- **Clinical IoT Data Validation and Interoperability** with Blockchain (with industry guidance on usage opportunities for other applications (Florence Hudson)
- **Techno-Legal Standards for Smart Contracts** for Supply Chain (Houman Shadaab, New York Law School/Accord Project)
- **Blockchain, IoT and Cold Chain Logistics** (Pharma Supply Chain)*
- **Blockchain for Compliance of US FDA DSCSA** (Drug Supply Chain Security Act)*

* Items noted are in the recruitment phase



Blockchain Matures

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Join the initiative at <https://www.blockchain.ieee.org/>

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Distributed Ledgers: Scalability and Sustainability

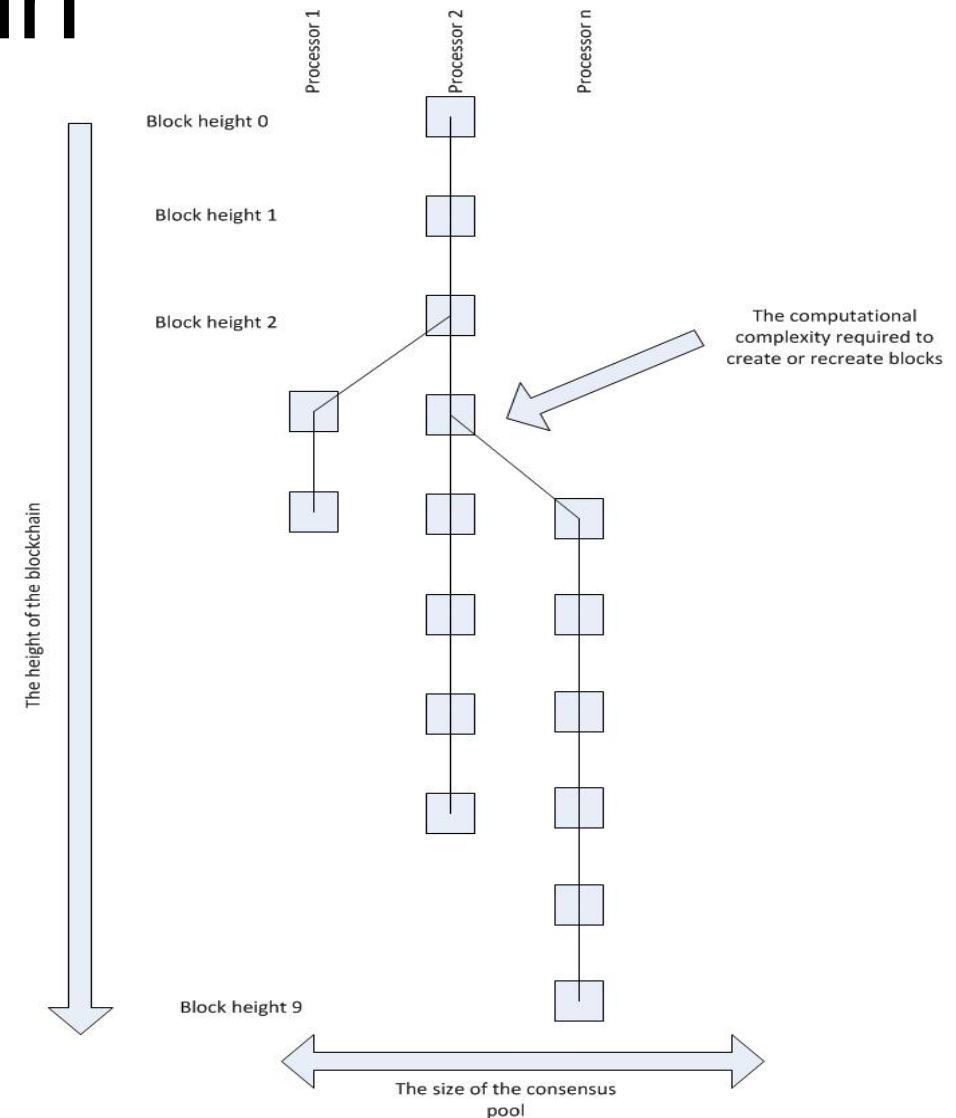
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Security of a blockchain

- Blockchains achieve security through three fundamental mechanisms
 - The computational complexity necessary to create a block and commit it to the chain
 - The number of blocks (height) of the chain
 - The size of the consensus pool (number of processors) participating to create the blockchain as distributed ledger



What factors impact scalability?

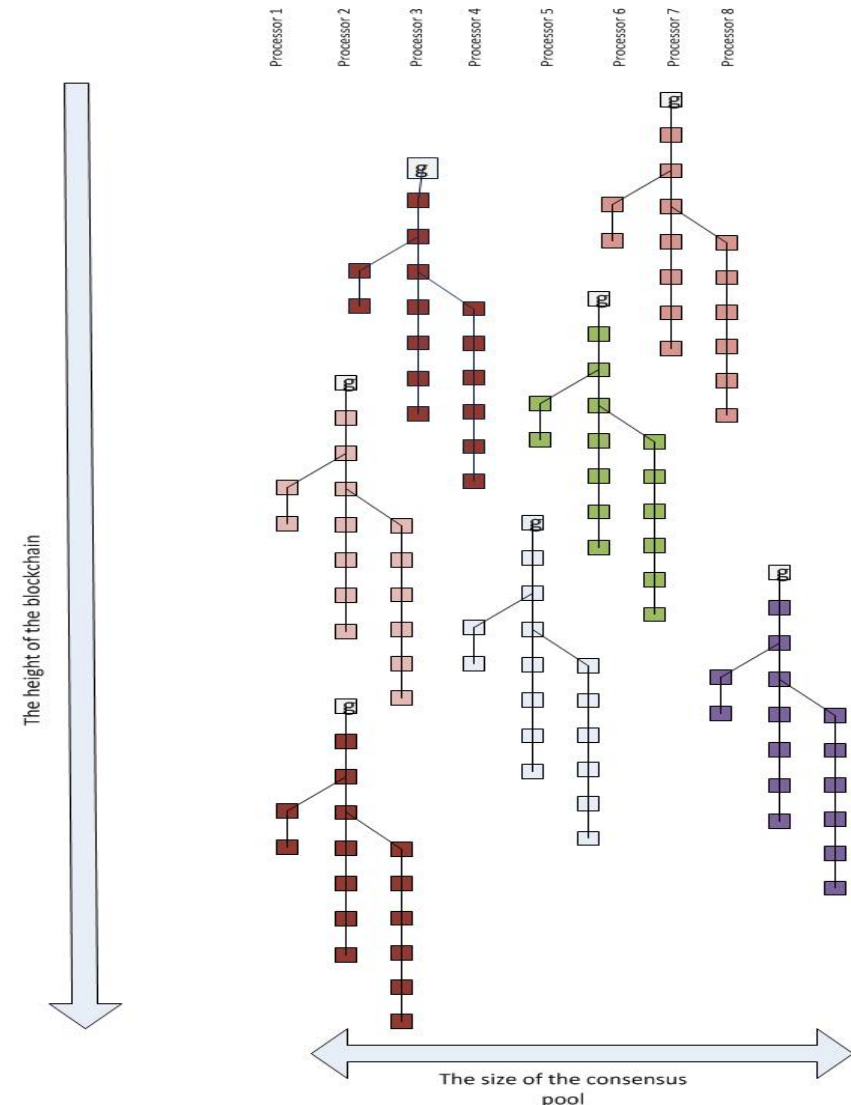
- Transaction size
- Transaction volume
- Maximum number of transactions to be included per block
- Bandwidth requirements to connect clients through a network to multiple processors
- The number of bytes per block may be limited
- Response times to confirm transactions
- Blockchain size (in terms of bytes and blocks)
- Valid transaction list length
- Computational complexity (cryptography), especially for proof-of-work consensus
- The number of nodes or processors necessary for meaningful consensus pool

A fundamental design flaw

- Most blockchains implementations assume the distributed ledger they create can scale for eternity
- Eternity is a really long time
 - Even a few decades is a very long time in Internet terms
- The notion that ANYTHING at Internet scale will remain viable for a few decades is probably unreasonable
 - It's probably unreasonable to expect all spendable transactions to stand on a queue or list indefinitely
- Corruption of a monolithic blockchain seems inevitable

A solution?

- Concurrent operation of multiple blockchains operating independently or co-dependently amongst a consensus pool
- Each blockchain will produce and maintain a distinct distributed ledger
- Result: A forest of blockchains



Conclusion

- Eternity is a long time
 - Blockchains can fail and recovery cannot be graceful
 - Successful attacks against consensus or breakdowns in governance have permanent consequences
- Blockchains can and should be designed to support the specific requirements of applications
 - If you are changing your application to suit a given blockchain environment or solution, maybe you should be asking yourself questions
- Virtualizing a blockchain environment that allows dynamic creation, adaptation, archiving, and termination (destruction) of chain provides scalability that doesn't currently exist

Parting thought

- Governance and consensus approach are EVERYTHING in distributed ledgers
- If you don't control the code, you're future is in somebody else's hands
- Consensus mechanisms assume a perfect world
 - What if the Byzantine General's problem included armies of different capabilities on varying terrain?
 - Perfection, of course, is unobtainable
- Security and scalability from YOUR VIEW start with how much control you have of governance and consensus execution



Read More:

[A Simple Overview of Blockchains](#)

[Blockchain Integrity, Security, and Reliability for Cable Use Cases](#)

[Comparing Blockchain Implementations](#)

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Practical Blockchain Development

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Putting Blockchain to Use (1)

- Complex solutions to simple problems
- The toy example
- Bob's Marble Shop
- Simple tokens
 - UTXO model



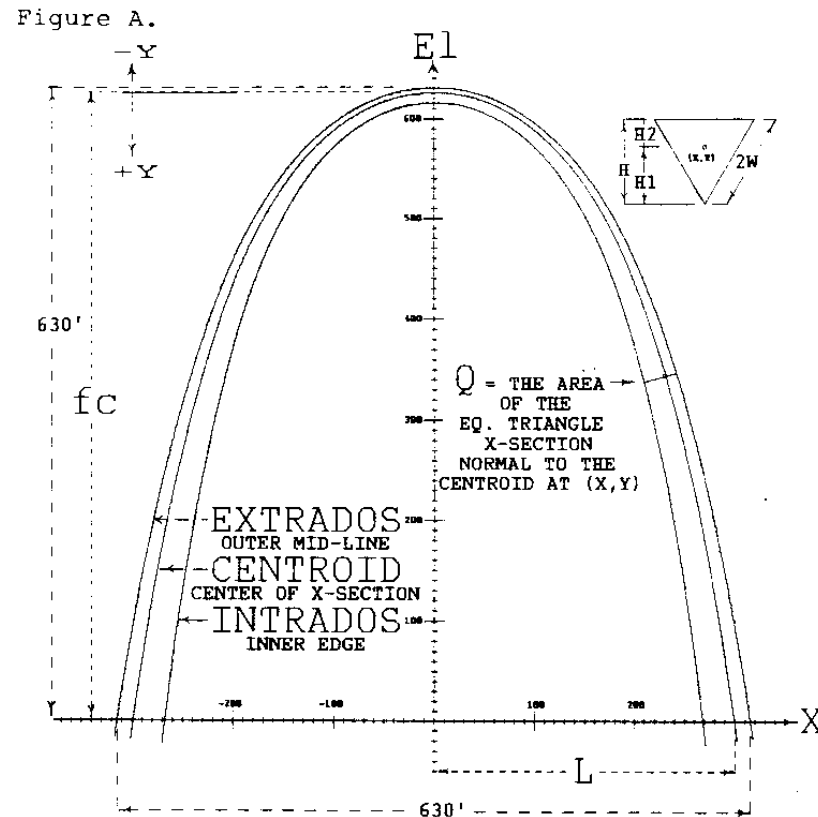
Putting Blockchain to Use (2)

- Existing use case
- Tracking opioid lifecycle
- Permissioned supply chain
- Actors:
 - Pharmaceuticals
 - Hospitals
 - Physicians
- Proof of concept application



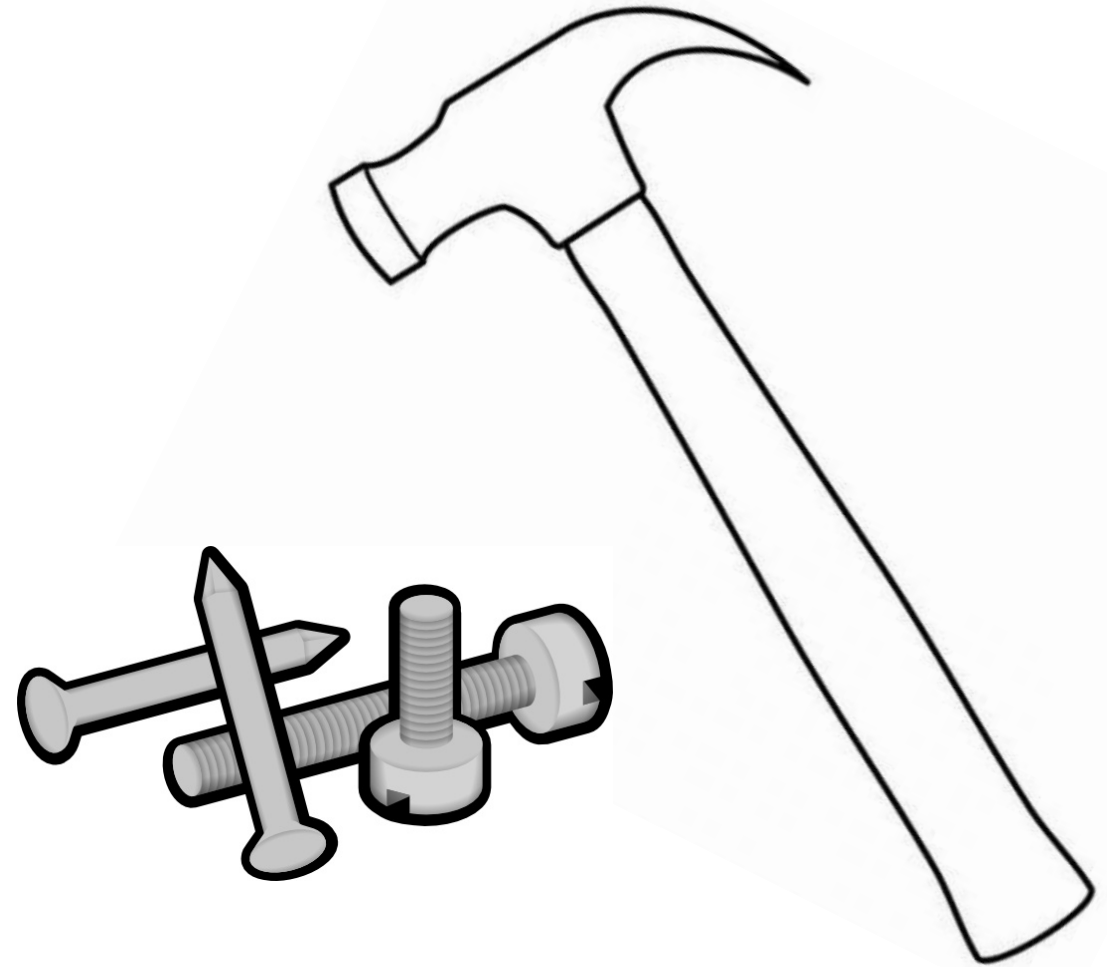
Lessons Learned

- Proper design is critical
- Maintenance is complex
 - Full record
 - Can't be ad-hoc
 - May not be possible
- Choosing a framework
 - Depends on application



The Right Tool...

- ... some of the time
- Best requirements for use
 - When is a database sufficient?
- What are some use cases?
 - Collaborative supply chain
 - Crypto currencies
- All built on the cable network





Blockchain Technologies

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Questions?

Resources for Q&A

- Basic overview video from UConn Cyberseed 2016:
<https://youtu.be/EZ3h0ldZU2w?t=2186>
- SCTE Expo paper: “A Simple Overview of Blockchains”,
<https://www.nctatechnicalpapers.com/Paper/2017/2017-a-simple-overview-of-blockchains-why-they-are-important-to-the-cable-industry>
- SCTE Expo paper: “Comparing Blockchain Implementations”,
<https://www.nctatechnicalpapers.com/Paper/2017/2017-comparing-blockchain-implementations>
- SCTE Expo paper: “Solving All Our Problems...Sort of...Blockchain Integrity, Security, and Reliability for Cable Use Cases”,
<https://www.nctatechnicalpapers.com/Paper/2018/2018-blockchain-integrity-security-and-reliability-for-cable-use-cases>

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Thank you speakers!



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