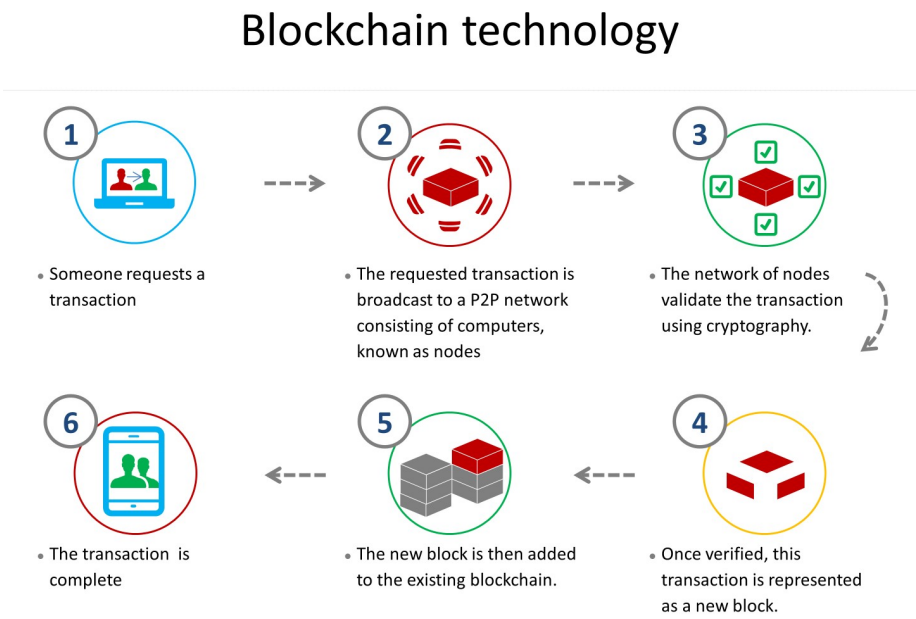
Blockchain

What Is Blockchain Technology?

A blockchain is a continuously growing list of records, called blocks, which are linked and secured. Each block contains a cryptographic hash of the previous block, destination, timestamp and transaction data. This technology allows efficient, reliable and transparent peer-to-peer transfer of digital assets and thus its potential impact on businesses is immense.

Depending on the decentralized governance, transaction is deemed valid. It is then added to the most recently verified block in the chain, creating a sequential ledger which is viewable by anyone and cannot be altered.

A distributed ledger is a database of transactions that is shared and synchronized across multiple computers and locations – without centralized control. Each party owns an identical copy of the record, which is automatically updated as soon as any additions are made.



Blockchain

Why the Tech Matters

- Blockchain can orchestrate and automate interactions with external parties.
- Streamline and integrate disparate systems, reducing data entry duplication and reconciliation.
- Blockchain's verification methods enable near to or real time processing and settlement of transactions without a central 3rd party.
- Combining with other emerging technologies become a force multiplier. e.g. combining blockchain, AI, ML, RPA for implementation in HHS applications.

Implications and Mission Benefits

- Enable secure, standardized data sharing in a trusted, assured, transparent ecosystem
- Reduces the risks associated with traditional/stove-piped database models
- Greater cost efficiencies & structural flexibility from continuous verification
- Robustness from distributed data with a single shared version of the truth
- Improved governance and visibility from shared ledgers and automation using programmatic "smart contracts"

Adoption Approach/Challenges

- Emerging standards (Note: NIST blockchain paper, along with Congress Promotion Act, both released October 2018)
- Blockchain is confused with cryptocurrency and hard to explain, with developers in short supply.
- Blockchain introduces lower immediate performance, higher complexity, and less privacy of traditional databases in return for increased disintermediation and robustness

Additional Information and Resources

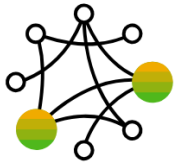
https://www.ibm.com/blockchain/platform/
https://en.wikipedia.org/wiki/Blockchain
https://blockchain.ieee.org/
http://www.gbaglobal.org
https://www.gsa.gov/technology/government-it-initiatives/emerging-citizen-technology/blockchain
https://csrc.nist.gov/CSRC/media/Publications/nistir/8202/draft/documents/nistir8202-draft.pdf

Blockchain Drivers

Security: The distributed and encrypted nature of blockchain mean it is more resilient and difficult to hack, respectively.

Automation: Blockchain is programmable – which will make it possible to automatically trigger actions, events, and payments once conditions are met.

Fewer Intermediaries: Blockchain reduces reliance on some types of third-party intermediaries – like clearinghouses, auditing contractors, and information brokers.



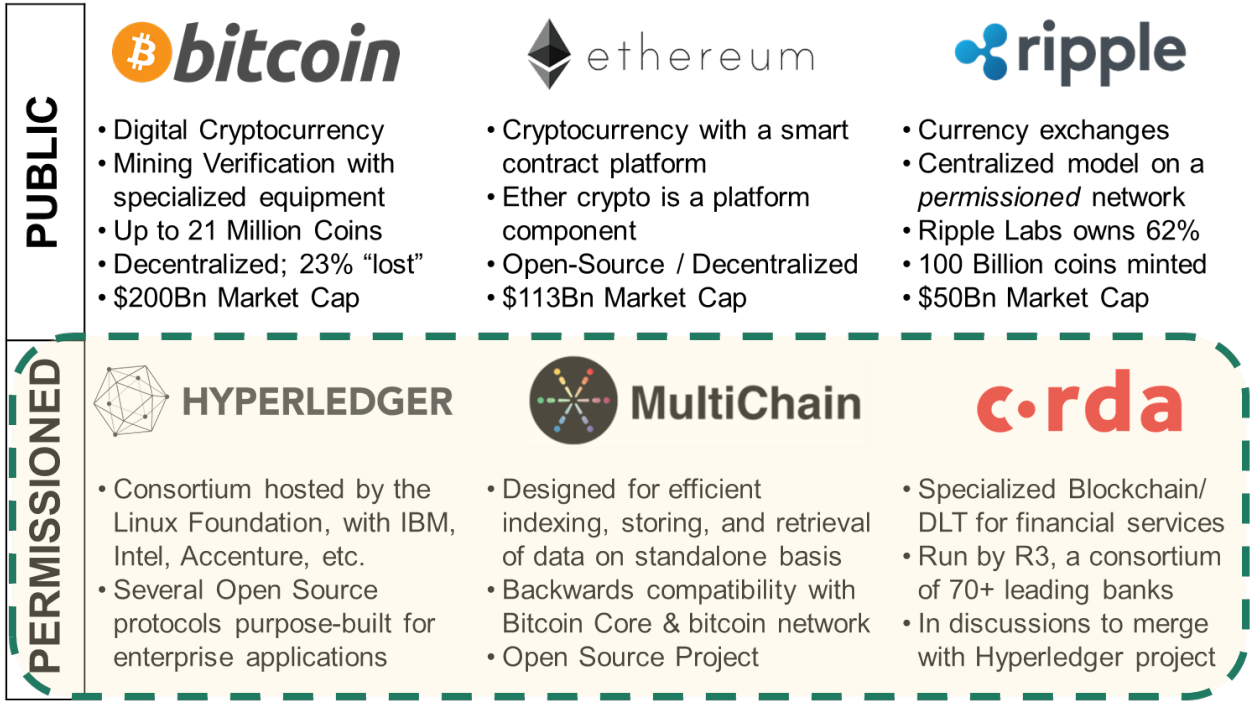
Faster Processes & Scalability: Blockchain can speed up process execution in multi-party scenarios – and allow for faster transactions with and without humans in the loop.

Transparency: Information in blockchains is viewable by all participants and cannot be altered. This will reduce risk and fraud, and create trust

ROI: Distributed ledgers will provide quick but lasting ROI by helping agencies create leaner, more efficient, and more profitable processes

https://www.sap.com/products/leonardo/blockchain/what-is-blockchain.html

Blockchain Sub-Elements



- Public, decentralized blockchains are those most closely associated with tokens or cryptocurrency, where anyone can participate in the consensus-driven ecosystem.
- Private, or "Permissioned", blockchains are access-controlled, so members must be invited to participate in the governed ecosystem, across multiple parties or systems within organizations.
- Private blockchains are more scalable and controlled, and provide the greatest near-term opportunity for DoD stakeholders. Permission refers to read, write, and/or verify.

Blockchain

Technical Principles: Distributed Consensus

Insights:

- Blockchain technology offers a way for untrusted parties to reach agreement (consensus) on a common digital history.
- A common digital history is important because digital assets and transactions are in theory easily faked and/or duplicated.
- Blockchain technology solves this problem without using a trusted intermediary.

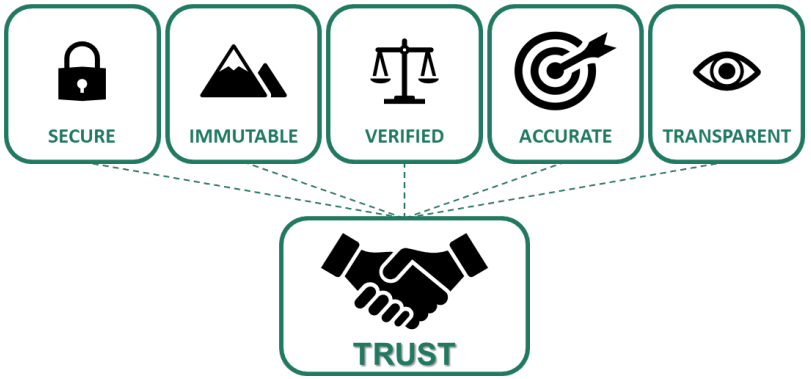
CBInsights, “What is Blockchain Technology?”

Blockchain

Technical Principles: Trusted, Verified, Auditable Ledger

Blockchain Technical Characteristics of a Trustworthy System

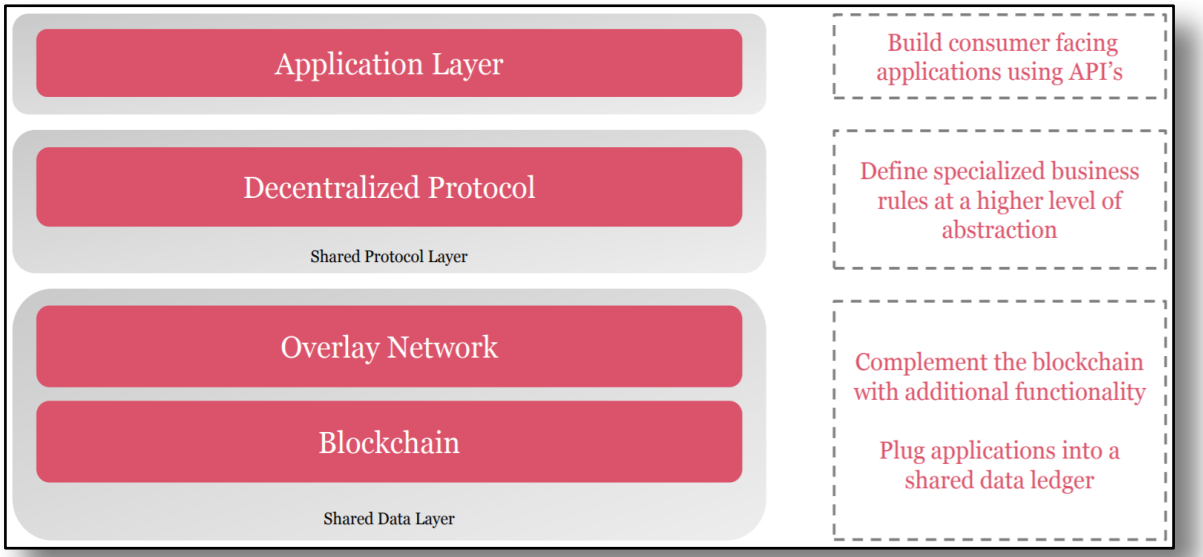
- **Secure:** hashed (encrypted) records are easy to verify given some input, but it's impossible to find the input which produces a known or preexisting hash value
- **Immutable:** blockchain systems are significantly more robust and resilient than traditional systems because there is no single point of failure
- **Verified:** consensus mechanisms enable autonomous governance capabilities, so data write access is controlled
- **Accurate:** users have predetermined controls and data access rights, so data is complete, accurate and consistent
- **Transparent:** a single shared ledger to record transactions reduces the clutter and complications of multiple data sources



Source: Colvin Run Networks

Blockchain

Technical Principles: Blockchain is a Foundational Technology

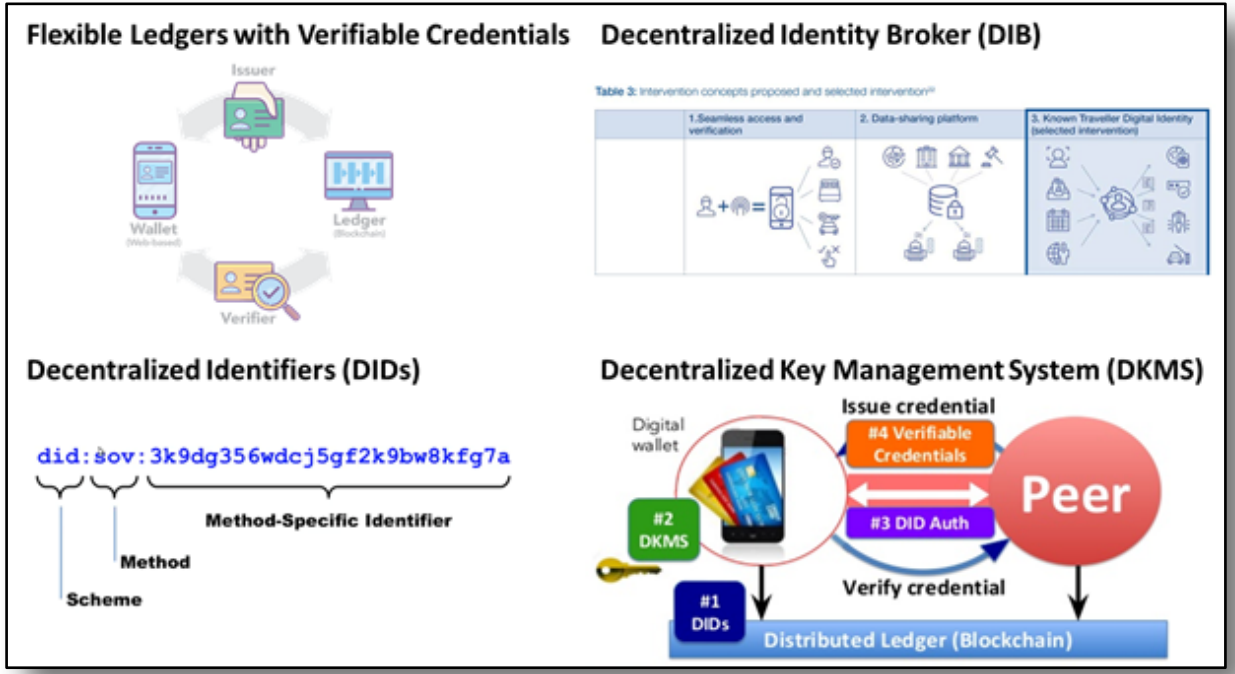


- Blockchain includes basic infrastructure, but many conceive of it as the entire "blockchain solution", which includes the blockchain infrastructure, the smart contracts, the APIs, etc. baked into the blockchain layer as depicted.

http://raw.rutgers.edu/docs/wcars/40wcars/Presentations/

Blockchain

Federal Scope: DHS Written Senate Testimony, May 2018

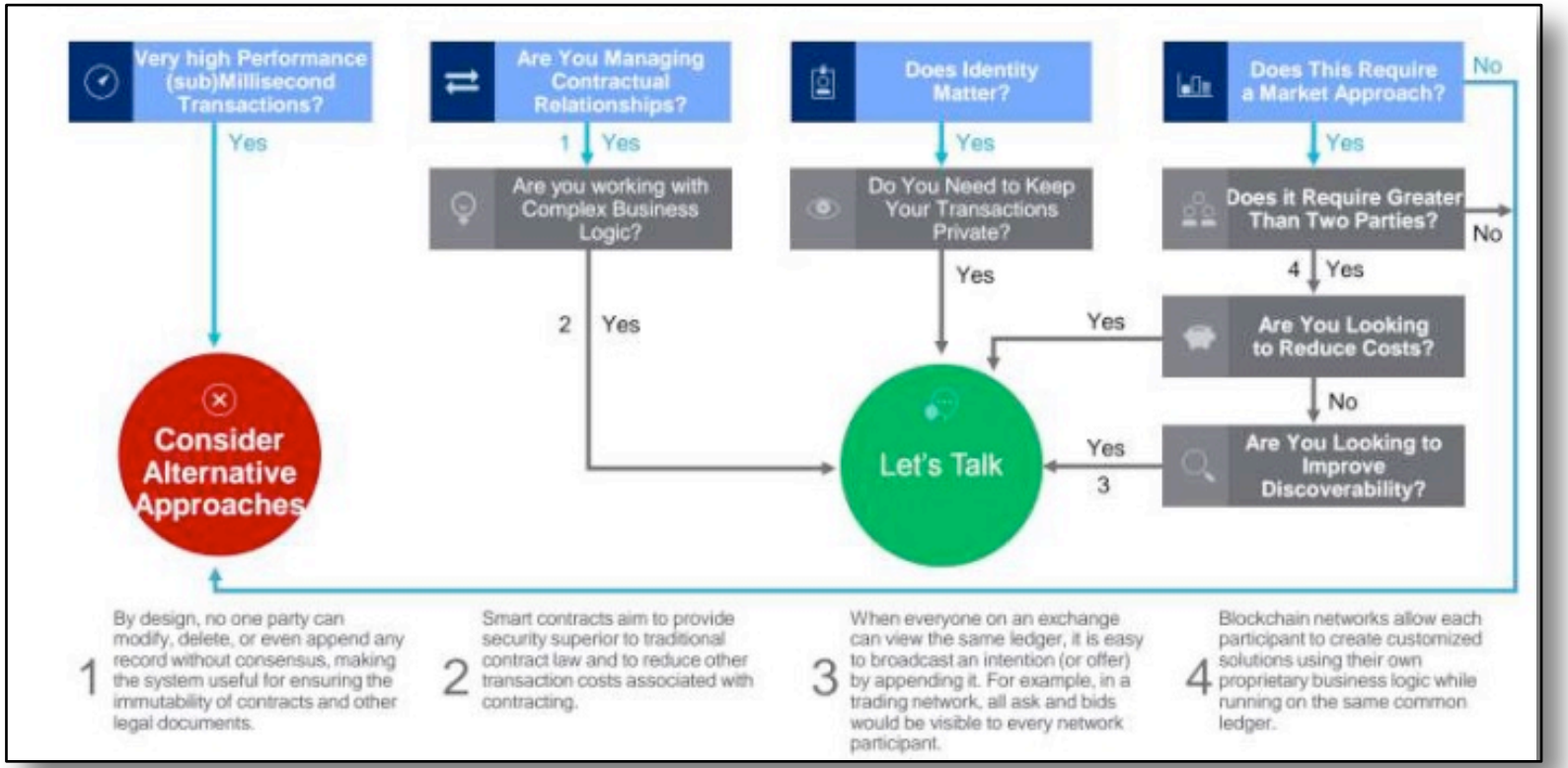


- Department of Homeland Security has extensively tested and piloted blockchain for a variety of use cases, including NAFTA trade enforcement in late 2018
- DHS sponsored creation of fit-for-purpose blockchain platforms that utilize W3C web open standards
- Most recent grant utilizes blockchain to secure IoT (internet of things) data with limited internet connectivity

https://www.dhs.gov/news/2018/05/08/written-testimony-st-house-science-space-technology-subcommittee-oversight-and

Blockchain

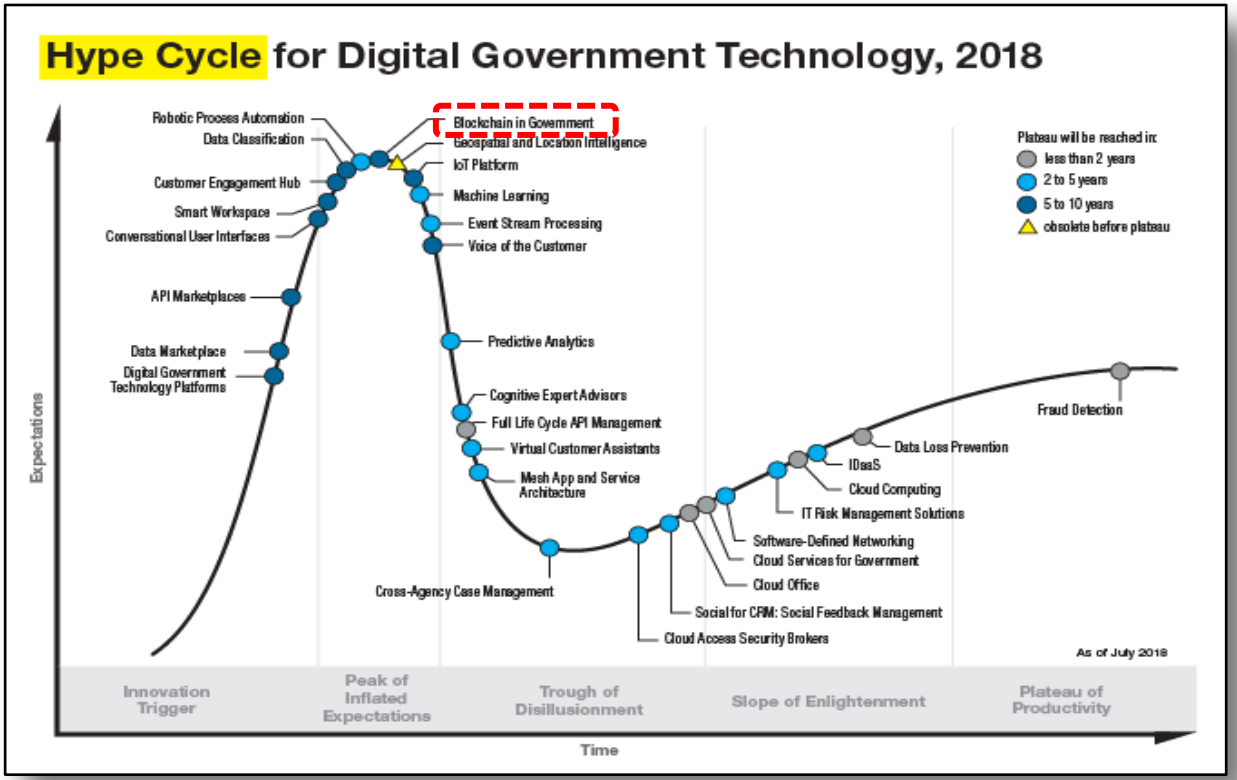
Decision Framework: Do We Need a Blockchain?



GSA, Feb 2018

Blockchain

Gartner Hype Cycle: Entering the Trough



https://www.gartner.com/smarterwithgartner/top-trends-from-gartner-hype-cycle-for-digital-government-technology-2018/

Blockchain

DoD Considering Applications for Armed Forces

Military Drone Technology and Communications

Blockchain can record and assure the data collected by AI-powered drones immutably and in real time.

Blockchain Battleships

Despite its age, the Aegis is a highly sophisticated piece of military technology. However, Aegis is a centralized system, with a single point of failure.

Decentralizing Weapon Control Systems

Blockchain allows decentralization of computing power across multiple nodes for supply chain risk management, software development, and systems engineering processes.

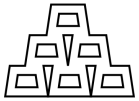
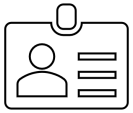
Additive Manufacturing

Blockchain could prove to be an enabler for widespread adoption of DoD AM into general manufacturing supply chains over the coming years

https://coincentral.com/blockchain-military-applications-the-future-tech-of-the-armed-forces/

Blockchain

Five Predictions: By 2030…

Prediction #1 Government Crypto	Prediction #2 Trillion-Dollar Protocols	Prediction #3 Blockchain Identity for All	Prediction #4 World Trade on a Blockchain	Prediction #5 (Blockchain4Good)
…most governments around the world will create or adopt some form of virtual currency.	…there will be more trillion-dollar tokens than there will be trillion-dollar companies	…a cross-border, blockchain-based, self-sovereign identity standard will emerge for individuals, as well as physical and virtual assets.	…most of world trade will be conducted leveraging blockchain technology.	…significant improvements in the world's standard of living will be attributable to the development of blockchain technology.

From An Op Ed piece by Ray Valdes (CTO @ ConsenSys) and Kate Mitselmakher (CEO @ Bloccelerate VC) on the future of blockchain technology:
https://medium.com/the-future-of-blockchain-technology-top-five/the-future-of-blockchain-technology-top-five-predictions-for-2030-67df1d7c2391