Blockchain Powered Distributed Applications*, Smart Contracts, and Healthcare Administration

* "DAPS"

- Objectives
- Blockchain:
    - What is it
    - How it plays in the larger context of distributed computing
- Potential applications in healthcare administration
- Appendix
    - Glossary/Abbreviations
    - Blockchain implementations
    - Key organizational players

Blockchain: What is it?

- At its simplest level, a blockchain is a distributed database; or more specifically: a distributed *ledger* that exists as one logical entity – but as countless physical copies across a worldwide network.

- This 'blockchain database' is *trustless* – that is: no one single authority or system "owns" the data governance of a blockchain. Rather, data integrity and immutability is maintained by any and all blockchain users via mathematically based consensus techniques.

- Blockchains take advantage of private/public keys for multiple purposes:
  - Assign IDs to people, accounts, assets, transactions, even services
  - Digitally sign transactions
  - Encrypt transactions

Blockchain: Where did it come from?

- Most people attribute the mature formulation of the blockchain architecture to the 2008 short paper: "Bitcoin: A Peer-to-Peer Electronic Cash System" by Satoshi Nakamoto.[1]

- Bitcoin is easily the single biggest example of a blockchain based system, employing what is now commonly called a "blockchain 1.0" approach. That is: the Bitcoin implementation of blockchain is relatively simple in terms of scripting language, and limited functionality (obviously focused on financial transactions 'ledger' type functions).

- Ethereum is an example of a "blockchain 2.0" approach – taking the blockchain approach to include distributed applications ("DAPS") as well as data. These "DAPS" are also called "Smart Contracts".

[1] "Satoshi" is long rumored to be Nick Szabo, a crypto-currency pioneer.

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Potential Applications in Health Care Administration

- **Telehealth/Telemedicine**: ability to have doctor and patient consult online with neither party knowing the identity of the other (see WSJ 6/29/16)
- **Provider Network Administration** – particularly "Alternative Payment Methods" – blockchain could help with automated contract updates.
  - ✓ *EXAMPLE 1:* Dr. Perretta has contract with Acme Health Plan. Last quarter he hit his HEDIS targets. Acme updates Perretta's "contract ledger" so that Perretta gets P4P bonus in coming quarter (e.g. a 'smart contract').
    > Could also have applications for Primary Source Verification (e.g. if DEA can update Perretta's blockchain records with his latest license information).
  - ✓ *EXAMPLE 2:* Variation of above: Acme Health Plan has a private blockchain for it and its providers. Acme uses Azure Ethereum to implement above. Microsoft seems to have thought thru enabling blockchains the most – to the point of building hooks into Visual Studio. The idea is to use that blockchain both for smart provider contracts and updated provider data.
- **Member eligibility** – US citizens voluntarily obtain a master ID blockchain account.
  - When Henry the Member is enrolled in Medicaid by Virginia – the VA Medicaid Agency (DMAS) updates Perretta's member ledger.
    - Then authorized parties (e.g. health plans, providers) can verify Henry's participation anytime they want. No "834 feed". Rather: "just in time" eligibility verification.
- **Health Information Exchange**. Notion is that there is a "patient ledger" and authorized parties get to update with ledger entries (lab tests, problems, conditions, whatever).
  > EXAMPLE: "Gem Health" is into this… building a blockchain network … and they are working with Siemens.
- **Patient Consent Management** (example: the Docket System).

Appendix

1. Glossary & Abbreviations
2. Blockchain Implementations
3. Blockchain key organizational players
4. Technology Library
5. Healthcare Applications Library

Glossary & Abbreviations

1. Bitcoin
2. DAO
3. DAPS
4. Ethereum
5. Hyperledger
6. Proof of work
7. Proof of state
8. oracle
9. Smart Contract

Blockchain Implementations

- Bitcoin
- Hyperledger
- Ethereum

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Blockchain: Key Players

- Gem
- Microsoft
- Consensus
- IBM