BlockApps STRATO Platform Vision

INTRODUCTION

BlockApps STRATO is a commercial grade Blockchain platform aimed at practical business and consumer usage. It is designed with application developers, business users and operational staff in mind. Its core organizational principles are:

- Acceleration over Invention
- Ease of Implementation and Operation
- Performance, Scale and Security

By *Acceleration over Invention*, we aim to leverage existing technologies and standards where they are applicable and of sufficient maturity - there is no need to reinvent the wheel. BlockApps leverages the Ethereum protocol faithfully and reuses the Solidity compiler without change; and integrates industry standard relational databases for search and reporting workloads adjacent to the Blockchain.

The adoption of Blockchain technology is constrained more by business and social issues than technical issues. Nevertheless, the knowledge of how to implement and operate the technology is scarce - especially in the burgeoning Enterprise Blockchain category. BlockApps platform aims to ameliorate the technical hurdles in deploying the technology from conception to production operation - *Ease of Implementation and Operation*.

Performance, Scale and Security reflects BlockApps commitment to best-in-class software architecture and enterprise “ilities” providing assurance to Enterprise Architects and System Engineers, as the full software development lifecycle is considered at each layer.

BACKGROUND

BlockApps is one of the longest running "Blockchain 2.0" companies and one of the first to primarily serve enterprise customers. A brief history of our product is below.

- August 2017 BlockApps Launches Developer Support Offering
- July 2017 Second Developer Training, Expansion to Atlanta, San Francisco Scheduled
- June 2017 First General Developer Training
- June 2017 BlockApps STRATO Available on AWS
- June 2017 BlockApps STRATO Management Dashboard Release
- May 2017 BlockApps Supply Chain Management Application release at Consensus Hackathon
- March 2017 Production STRATO Smart Contract Manager ("bloc") release
- Feburary 2017 BlockApps STRATO Available on Redhat OpenShift
- Feburary 2017 BlockApps becomes founding member of Enterprise Ethereum Alliance
- December 2016 STRATO Smart Contract Reporting Engine ("Cirrus") released
- September 2016 Tyler Smith demos BHP application at DevCon2
- June 2016 Work begins on BHP Sample tracking application
- March 2016 BlockApps launches C# library
- March 2016 BlockApps announces visual studio extension at MS Build conference
- Feburary 2016 BlockApps adds Smart Contract RESTful API to bloc
- February 2016 BlockApps launches block explorer
- January 2016 BlockApps STRATO becomes the first blockchain offering on Microsoft's Azure marketplace
- November 2015 BlockApps live demo at Ethereum DevCon1
- October 2015 Blockchain as a Service Concept Launched With Microsoft.
- August 2015 First external BlockApps hackathon in Brooklyn, NYl. Larger and more sophisticated applications created than the first.
- August 2015 First BlockApps initiated livenet transaction.
- August 2015 Initial Smart Contract & Account management API created.
- June 2015 First internal BlockApps hackathon in Brooklyn, NY
- April 2015 BlockApps incorporated officially.
- October 2014 ethereumH work begins in Bay Area. BlockApps is the first company fully external to the Ethereum Foundation to produce a livenet compliant Ethereum client.

FUTURE VISION

Three key technological themes we will explore are:

- The development and growth of the Internet
- The adoption of Electronic Data Interchange
- The history of Database Management

Blockchain Technology in historical context is best understood in reference to these categories.

The Internet

The internet is a marvel of human achievement. Through a happy mix of deliberate engineering and emergent organization, it has become the world's primary method of communication and is its key commercial growth vehicle.

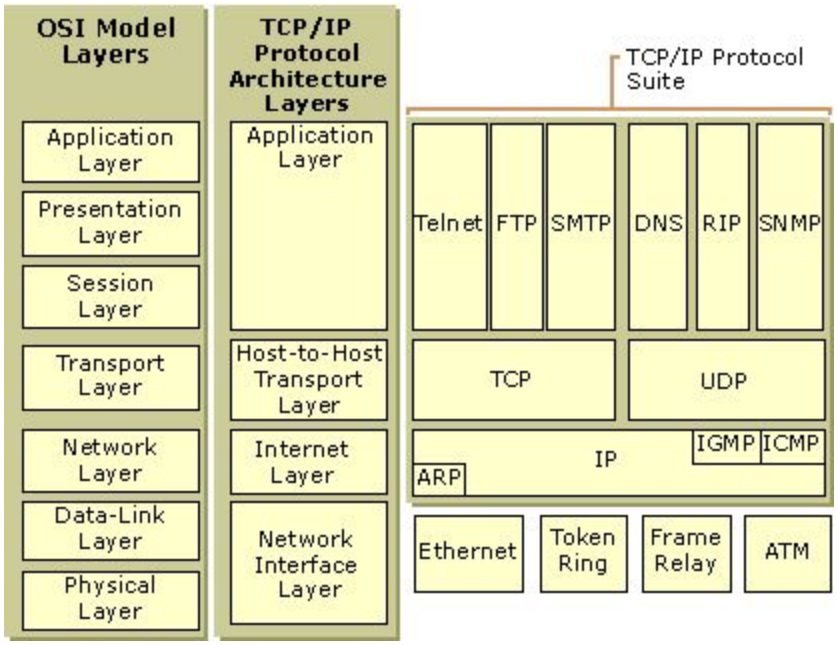
Conception
Tim Berners-Lee conceived of the internet as a linked-information system:

> In providing a system for manipulating this sort of information, the hope would be to allow a pool of information to develop which could grow and evolve with the organisation and the projects it describes. For this to be possible, the method of storage must not place its own restraints on the information. This is why a "web" of notes with links (like references) between them is far more useful than a fixed hierarchical system. When describing a complex system, many people resort to diagrams with circles and arrows. Circles and arrows leave one free to describe the interrelationships between things in a way that tables, for example, do not. The system we need is like a diagram of circles and arrows, where circles and arrows can stand for anything.

Berners-Lee's forecast proved extremely prescient. The success of the internet as a system for recording and sharing information led to its subsequent success in almost all commercial domains.

As an Application Platform
The "end to end principle" is a design consideration of the internet which stipulates that the reliability of networked communication is better ensured by the ultimate end hosts rather than intermediate hosts - "dumb pipes, smart hosts." "Net Neutrality" is a commercial and political extension of the end-to-end principle, which holds that Internet Service Providers should not discriminate on the content, structure or profile of the traffic passing through it.

Why might ISPs be interested in being more than just "dumb pipes?" The direct value generated by the internet (and captured by commercial entities) is at the application layer - the entry point for consumption of products and services - and above. Pictorially,



ISPs mediate traffic at the lower layers, while players like Google and Apple do so at the application layer. The number of supported technologies has moved value to the application layer as the power of those applications has expanded. These technologies and protocols have not been standardized as the lower level protocol elements have. Similarly, applications themselves do not interoperate to the degree that protocols do.

Extensibility and the Missing Layer

What's missing? Why don't applications interoperate? A possible answer is that APIs exposed by applications are non-existent or non-standardized. The proliferation of REST APIs and SOAP APIs before them achieve a limited application interoperability - in essence, they allow applications to share data. They do not typically synchronize data models or allow for cross-application transactions.

Interoperability doesn't always make business sense in that it may reduce a product or service to a commodity. Conversely, great global return can be made on infrastructure investments - interoperable infrastructure allows the tides to rise for all. We see Blockchain technology as the missing transactional data layer for the internet, whose adoption will lead to a next generation of interoperable applications.

Electronic Data Interchange

Alongside the internet, Electronic Data Interchange (EDI) has a fifty-year history, which only converged with that of the internet in the nineties. EDI is defined as a means of computer to computer data transfer according to structured, agreed protocols. The first EDI transmissions were sent on the transatlantic

Holland-America steamship line in 1965. By 1968, EDI had greatly increased in popularity and the Transportation Data Coordinating Committee was formed to combat the complexities of interpreting communications as shipping companies, airlines, railroads and other transportation providers were sending non-standard data transmissions. The first packet switched EDI network, Telenet, was established in 1975. Termed a Value Added Network, Telenet allowed enterprises to connect to its commercial packet switched network.

In 1981, the ANSI X12 standards were published covering banking, transportation, food, drug and warehousing. By 1982 larger manufacturers like Ford and General Motors, and major retailers like Sears began to mandate the use of EDI for their suppliers. 12,000 US businesses deployed EDI by 1991. In 1996, the internet made point to point EDI more feasible. By 2004, Walmart began to mandate the use of the AS/2 point to point EDI standard for its suppliers. At present over 100,000 businesses including 90% of the Fortune 500 employ EDI.

Data and Database Management

Organizations are defined by their record keeping practices. An organization's business is the set of legal contracts and transactions it engages in. Keeping records is a complex and demanding process and is one of the motivating use cases for automated database management systems.

Database Paradigms

Databases have passed through several architectural paradigms with only a few lasting models. Early network and hierarchical databases still run mission critical production systems in several industries, but have largely been obsoleted by the relational model. Relational Database Management Systems power the majority of critical business systems. NoSQL models (Key Value, Document, Graph, ...) have risen to fill in some of the data model and workload gaps left by relational databases. NewSQL technology has in turn appeared to re-introduce some of the desired features of the relational model to NoSQL type technologies. We see Blockchain technology as a new database innovation with different impacts and goals than either of the No and New-SQL movements.

Interaction with the Internet

The growth of the internet lifted the tide of companies like Oracle whose database was used by most early internet companies. It also created new database workloads and data models which imposed new requirements on the technology. The solutions to these problems have created great technology. Blockchain technology solves an orthogonal class of problems which are also related to requirements imposed by the internet.

Blockchains versus Databases

Blockchains do not need to solve the problem of search and retrieval of data and can instead leverage existing database technology for this purpose. Blockchains are differentiated at executing a new wave of

distributed transactions - coordinating business transactions and workflows across distinct corporate or operational entities. In doing so, Blockchain technology will allow databases to be internet native in the way they have not been in the past.

Utilities, Custodians and Clearinghouses

Internet Service Providers have a well understood utility business model. They are very similar to power or telecommunications providers in that they provide critical networked services at relatively low prices. These services are also notably interoperable, with well delineated regions of coverage.

Other prominent internet business models are closer to custodian, broker or clearinghouse models. For instance, Google custodies internet and consumer mobile data and matches sellers with consumers through AdWords. Amazon.com matches consumers with retail goods. In addition to renting out compute power, Cloud Computing providers provide extensive data storage and retrieval services. Financial Providers like Swift provide clearing services, providing the authoritative source of record for financial transactions. Travel Distribution companies like Sabre and Travelport provide travel inventory clearing services.

We expect these business models to be threatened in general. As data custodial and clearing services become less differentiated at a technological level, the utility business model is likely to be more viable than the others.

Category	**Representative Companies**
Internet Service Providers	AT&T, Comcast, Verizon
Database Management	Oracle, IBM, Microsoft
Financial Services Clearing and EDI	DTCC, Swift, ACH
Mobile Technology	Google, Apple
Search	Google, Microsoft
eCommerce	Amazon
Travel Distribution	Sabre, Travelport
Cloud Computing	Amazon, Microsoft, Google, VMWare, IBM, Oracle
Enterprise Resource Planning	SAP, Oracle
Enterprise Application Integration	Informatica, Dell, MuleSoft, Microsoft, Oracle, IBM

Integration - Point to Point or Central Broker?

How are applications integrated today? How is data shared today?
The two main approaches are point to point integration and brokered integration.

Point to Point
A point to point application integration approach is likely what would grow organically between communicating applications or trading counterparties. It refers to a pattern of pairwise integration - if there entities A,B,C engage, they do so only in pairs AB, BC, AC. The trouble with point to point integration becomes clear at three or more entities - there is complexity in reconciling the transactions between AB versus AC.

Brokered
The brokered integration pattern is an answer to the reconciliation problem that naturally emerges from the point to point model. All transactions will be mediated by a central actor, which creates an authoritative source of record for the interacting parties.

Blockchain
Blockchain technology offers a new integration paradigm incorporating the key advantages of both point to point and brokered integration models. It achieves the complexity reducing approach of the brokered model without the operational difficulty of depending on a central broker.

Integration Style	Complexity of connections between N applications or businesses	Unified Data Model and Workflow	Mediating / Operating Entity
Point to Point	N^2	No	No
Brokered	N	Sometimes	Yes
Blockchain	N	Yes	**Optional**

Conclusions

Internet Applications will Interoperate
Web applications will achieve much greater interoperability than we see today. The interconnectedness of the brick and mortar economy will be strongly mirrored in the digital economy.

Industries will achieve Operationally Unified Processes and Data Models
Software standardization will allow the definition and execution of industry standard data models and business processes.

Frictional Transactional Costs will Approach Zero
Transactions, financial and otherwise, will be software mediated. The cost of doing business will fall in general due to software standardization of the lifecycle of business transactions. BlockApps STRATO is one of the key technologies which will accelerate the reduction of frictional transactional costs.