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A Comparative Study of Enterprise Blockchain Platforms: Dragonchain and Komodo

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ABSTRACT: Blockchain is a distributed computing platform with potential for digital disruption. Platformization of information technology has resulted in ecosystems that deliver innovative products. Blockchain is revolutionary and blockchain capabilities are evolving. With the emerging needs and requirements, different blockchain platforms have been developed. Blockchain is game changing technology that paves way for trusted transactions among untrusted participants. Diverse variations of blockchain have emerged since bitcoin. Many of the blockchain platforms like Etherium, VeChain, Ripple etc. that were developed till two years ago are not Turing Complete. Blockchain has evolved rapidly over the years and the evolution can be categorised into four eras.Four main eras of blockchain technology are the Monolithic Calculator Era exemplified by Bitcoin, the Mainframe Era with smart contract for which Etherium is an example, The Server Era to improve upon the limitations of smart contract platforms like network congestion, high fees, a lack of scalability, and limited application functionality. Both Dragonchain and Komodo are representative server era blockchain platforms. Finally Composability Era blockchain platforms are yet to evolve. This paper attempts to provide a comparison of major features of two enterprise blockchain platforms namely Dragonchain and Komodo. Both Dragonchain and Komodo are opensource platforms with different design goals and philosophy. The strong reason for choosing Dragonchain and Komodo is that both are Turing Complete. Explorative study approach is employed to consolidate key concepts of these turing complete enterprise digital platforms Dragonchain and Komodo.

KEYWORDS: Turing Complete, digital asset, atomic swap, interchain, multichain, fiat currencies

I. INTRODUCTION TO BLOCKCHAIN

Blockchain is a decentralized, transparent and trusted database, defined as part of the Distributed Ledger Technology (DLT) framework[1]. Blockchain can be considered as an enabling technology of new IT enterprise systems and applications. Though blockchain technology is still in its infancy the compelling security with blockchain will ensure that the technology will quickly find its way into every industry in the world in the future. Smart contracts are self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code. The code and the agreements contained therein exist across a distributed, decentralized blockchain network. Smart contracts permit trusted transactions and agreements to be carried out among disparate, anonymous parties without the need for a central authority, legal system, or external enforcement mechanism. Smart contracts render transactions traceable, transparent, and irreversible.

II. STATE OF THE ART IN BLOCKCHAIN PLATFORMS

In the present digital world, change is the only thing that is constant. A platform is a product that serves or enables other products or services. A platform is a group of technologies that are used as a base upon which other applications, processes or technologies are developed.

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A platform is composable if its existing resources can be used as building blocks and programmed into higher order applications. Composability [2] is important because it allows developers to do more with less, which in turn, can lead to more rapid and compounding innovation. Turing complete refers to the ability of a theoretical computing system to simulate a Turing machine. Over the years, blockchain has evolved rapidly. The evolution from blockchain 1.0 to 4.0 can be summarized into four main eras while 5.0 is in the process of emergence.

Blockchain 1.0: Currencies

The Calculator Era : application specific, limited composability : Bitcoin is representative of the first era of blockchain. Characterized by a single, monolithic blockchain without the ability to host apps, games, or software, this era of blockchain focused on providing the ability to send and receive tiny bits of data. In other words, these Calculator Era blockchains were innovating a digital form of cash: cryptocurrency.

Blockchain 2.0: Applications

The Mainframe Era: Turing-complete, high composability : Several years later, a new type of blockchain arrived: the smart contract platform. Ethereum was the first project to introduce a blockchain-based virtual machine, which let any third-party project submit code to the Ethereum network. This model uses a pay-per-use model that allowed many new projects to quickly adopt blockchain. However, there is just a single blockchain with one shared network for everyone to use, similar to early mainframe computers. This causes congestion and high fees while also limiting autonomy.

Blockchain 3.0: DAG

The Server Era: Application specific, punt on composability : Directed Acyclic Graphs of blocks:To improve upon the limitations of smart contract platforms like network congestion, high fees, a lack of scalability, and limited application functionality. Projects such as Polkadot and Cosmos presented application-specific blockchains that operate independently of other chains on the platform. These independent, application-specific blockchains can be thought of as dedicated servers.

Blockchain 4.0: Industries and Cross-Chains

The Cloud Era : Turing-complete, scalable composability :While Server Era platforms offer unique blockchains, third-party projects still are not allowed to own and control their own blockchain. This is similar to renting a dedicated server from a data center.The Cloud Era moves beyond server era model with composable solutions, in which third-party projects have full autonomy, control their own blockchain, and never pay fees in a non-native currency.

Blockchain 5.0: World

The Human Centric Era : Summation of blockchain 2.0 and blockchain 3.0 : Fusion of DAG with smart contracts [3] Includes abstract elements such as unique technology, high speed, and innovations. Most likely, 5.0 projects will be linked with innovative industries such as biotech, aerospace or robotics. With blockchain 5.0 the world can benefit from higher speeds and throughputs with lower network fees.

III. FIVE PILLARS OF ENTERPRISE BLOCKCHAIN SOLUTION DESIGN

The quest to find functional Blockchain solution designs, which can scale to enterprise requirements, is attracting many researchers today. Banks, FinTech entrepreneurs and legacy infrastructure providers like IBM have requirements which far exceed Public Blockchain's (bitcoin) current capabilities. For instance, with bitcoin's capacity today being at 220m transactions per year, any substantial bank will single-handedly exceed this limitation.When you start using transactions as a record and data integrity management service, the number of transactions can quickly explode, ie notarization to prove the existence or authenticity of a record/document and its status.The problem with this unfolding thought-process of bitcoin cannot achieve it, hence build your own, is the resulting 'purely private Blockchain' designs, which sacrifice security and immutability for scale and privacy. Solutions vary in application, but they all share the same infrastructure design considerations at the core. The five key pillars of enterprise blockchain solution design requirements [7] are permissioned/private, decentralized/peer to peer, immutability, scalability and security :

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1. Permissioned/Private : Writing records is exclusive to members, third parties can be granted only read access, the general public excluded. The permissions architecture goes beyond 'access = everything' and allows third party access to specific raw data, as deemed appropriate, for interoperability and application requirements.
2. Decentralized/P2P : Allowing for equal control over the shared database, between all permissioned participants, and of equal importance. Distributing the number of full copies (nodes) of the ledger to maximize probability that there will always be a complete record in existence and available for those with permission to access.
3. Immutability to achieve Data Integrity : Records are guaranteed to be cryptographically secure, with no possibility of bad actors threatening data integrity.
4. Scalability : The ability to secure trillions of transactions or records without compromising the networks synchronization, security, accessibility or data integrity.
5. Security : Support for data encryption and the management and enforcement of complex permission settings for participants and third parties.
Blockchain technology for enterprise applications, particularly for the financial service sector, requires all the five pillars to be incorporated in its solution design. These functions will ensure that the solution can not only scale, but comply with regulation, offer consumer protection through privacy and security, and meet a growing list of feature requirements. Typical solutions often fall short on one to two of the above five key requirements. For example, and perhaps contrary to some thought-processes evident in various solution designs today, building on the bitcoin Blockchain is currently the best chance of longevity. Bitcoin has the biggest network effect and an excellent monetary incentive for transaction processors to keep updating and verifying records. However, it does not currently allow for the transaction volumes, permission settings and data-storage/sharing requirements of enterprise companies. This is often looked at as a shortfall of bitcoin's own solution design. Most private Blockchain solutions are built on their own Blockchain, and end up offering vast scalability at the expense of solid immutability and security. Instead of a single mathematical or cryptographic solution, it is better to take a systemic approach by effectively offering two Blockchains. One acts as a private data-store, security and integrity engine. The other being public and incentivized, addressing the finality, security and immutability requirements.Separation of immutability from scalability considerations, solves several current Blockchain design bottlenecks.The outcome is a foundation which can service the demands of enterprise applications without compromising on one of the five key enterprise solution design requirements.

IV. DRAGONCHAIN AND KOMODO PLATFORMS

Dragonchain is a blockchain platform that makes it possible for enterprises to implement a secure and high-performance blockchain solution using Docker containers. Dragonchain is a public/private hybrid blockchain providing a cloud-based model for Blockchain as a Service that facilitates the developers to build applications at a faster rate than other blockchain solutions. Dragonchain platform is built to eliminate the need for server setup, patch implementation, and updates. This saves developers time that can be used to create decentralized applications and smart contracts. Dragonchain also offers a set of additional services by including a library of smart contracts, and rich APIs to power blockchain applications to spin up ones own blockchain in minutes, with full control over scalability and flexibility. Interchain, a patented technology of Dragonchain, allows all blockchains, both public and private, to connect and interact securely. With Interchain capabilities, Dragonchain redefines the use of blockchain technology. By allowing users to conduct processing across different blockchains, providing true interoperability, it simplifies business processes with added security and utility, high transaction speeds, and low operational costs. Interchain allows for interoperability with public blockchain networks such as Bitcoin, Ethereum, and Ethereum Classic.
Choosing a blockchain platform can be a difficult decision that also has the added uncertainty of what will happen to a blockchain. Interchain can address these concerns by giving users the added capabilities of multiple blockchains, while also providing the flexibility of not having to commit to a single platform. This breakthrough technology gives you blockchain interoperability, enabling the widest range of functionality, the most options, and the greatest amount of security to help you create future-proof blockchain solutions. Major concern of Dragonchain platform is that it is centralized since all the computations are made on Amazon Web Services servers

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Blockchain interoperability is one of the biggest emerging requirements with many blockchain companies claiming to be developing this capability. Interchain as a Service (IaaS) from Dragonchin makes connectivity between blockchains a reality.

Komodo is a fully-decentralized and open-source blockchain ecosystem with a strong focus on the principles of independence, autonomy and collaboration[5]. The objective of Komodo was to design an independent blockchain architecture that would allow all blockchain projects to avoid the shortcomings of the original, single-blockchain model. The key features of Dragonchain and Komodo as adapted from [4] are summarized in Table 1 below:

Table 1 : Comparison of Dragonchain and Komodo Platforms

Feature / Description	*Dragonchain Platform*	*Komodo Platform*
Description	Blockchain as a Service for businesses which allows to create serverless applications on AWS with transactions recorded on the blockchain. Dragonchain aims to provide low development costs, fast speed to market, high security, high customizability, high scalability, protection for business operations and data. It's also an eosystem which consists of the platform itself, smart contract libraries marketplace, and ICO incubator. It is most likely to be used by mid-sized organizations who are interested in using blockchain, but don't have the resources and skills.	Privacy coin with smart contracts, interoperability and decentralized ICO.
Differentiating Features	Serverless deployment on Amazon Web Services, which means each project can scale up to Amazon level transaction volume, which amounts to limitless scalability. Hybrid blockchain solution where local business rules are integrated. Network consensus is acheived through five step context based verification happening on different blockchains, where private data in the transaction is kept private, while in the end the transaction can be recorded on public ledger. This protects business data and operations, and improves security. This model will more likely be trusted by organizations. Currency Agnostic and has Multi-Currency Support. Cross-chain interoperability. Developer-friendly, makes it easy to integrate new and legacy systems with the blockchain. Smart contracts can be written in widespread established languages (Java, Python, Node.js, C#, Go). Marketplace for smart contract libraries and vendors. Incubator, similar to YCombinator, which actively works with the teams of ICOs held on Dragonchain. Holders of Dragons can get discounts on those ICOs.	Each project can have its own customizable blockchain. Modular: developers can choose which technologies to use in their projects. Decentralized exchange:BarterDEX. Decentralized anonymous ICOs: ICO is sold through BarterDEX exchange, allowing for anonymous purchases of ICO and for ICO to be traded from the very start. Consensus mechanism with improved security. Anonymous atomic swaps between most cryptocurrencies, including a bridge between Ethereum-based and Bitcoin-based currencies Fiat pegged assets. zk-Snarks: privacy technology from Zcash. Lightning Network integration.
Turing-complete	Yes	Yes
Achievable functionality	Turing-complete smart contracts allow for any functionality	Turing-complete smart contracts allow for any functionality
Smart Contract languages or API	Languages supported by Amazon Web Services: Java, Python, Node.js, C#, Go	Language-agnostic smart contracts
Transactions per second (tps)	Not applicable, different for every project	Target set at 10,000 tps

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capacity		
Transaction confirmation time	Not applicable, different for every project	with Lightning Network: less than a second or several seconds
Deterministic transaction finality	Spectrum of consistencies at various levels	No
Consensus mechanism and security	Nodes can approve transactions based on local business logic through five levels of consensus, with each level increasing the security: Level 1 :Business verification (approval): controls the approval of transactions based on localized business rules (trust basis). Since the data makes use of localized business rules, it is considered trusted by the owner and can integrate existing system capabilities, reducing the learning curve of blockchain applications. Level 2 : Enterprise verification (validation): performs real-time governance, which is defined at enterprise level, in order to check the validity of blocks and transactions regardless of local business data. Level 3 : Network diversity verification: provides control and measurement, as well as distributed security from attacks, by ensuring validations from level 2 are coming from a diverse set of sources. Level 4 : External partner (notary): level 4 nodes are hosted by a trusted external partner which acts as a notary to cryptographically sign any level 3 verifications. Level 5 : Public bridge: the final level bridges the enterprise blockchain with one or more public blockchains such as Bitcoin. This multilevel model provides the ability to keep private data away from public ledgers. A business may choose to employ another blockchain at any level of the verification process. For example, to provide a decentralized Level 1 approval implementation, one may choose to employ Bitcoin or other proof of work based blockchain to come to consensus on a currency transactions.	Delayed Proof of Work (dPoW). Komodo network has its own initial consensus mechanism, and on top of it each project's blockchain data is notarized on the Bitcoin blockchain. Komodo is re-using Bitcoin's hashrate, giving any blockchain project using it (no matter how small) the benefits of the security of the Bitcoin blockchain, while also saving on transaction costs. There are 64 notary nodes which are elected by holders of KMD.
Main currency	Dragons ($DRGN) is an ERC20 token and there are no plans to create a native currency for Dragonchain. Dragonchain uses BTC and ETH in its consensus process and using ERC20 tokens was pragmatic for infrastructure. Tokens are used when interacting with the platform, incubator and marketplace. Uses : To launch nodes, call/execute smart contracts; To buy turn-key products in the marketplace, like subscribing to a data feed or accessing an advanced smart contract library; To make use of a special discount that all incubator ICOs provide to Dragon token holders. There is a	Komodo ($KMD), will be used as fuel for smart contracts, for using Jumblr, for electing notary nodes.

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	"slumber score" which equals the product of length of time the Dragons are held and the number of Dragons held. The higher the score, the bigger the discount, the earlier one gets access and the higher allocation one receives.	
Digital assets		Yes Decentralized Fiat Currencies: Cryptocurrencies tied to fiat currencies. They are traded through atomic swaps on BarterDEX. The conversion rates are determined by European Central Bank data feeds and prices of BTC-USD, KMD-BTC, and BTC-CNY. Swaps for any currency can be performed as long as there is a liquid BTC/KMD market. Currently 32 fiat currencies are supported."
Cost of basic transaction	Same as for other ERC20 tokens.	
Mainnet launch status	There is no mainnet, but commercial serverless platform on AWS was launched in March 2018.	Mainnet live since 2016
Origin and Project history	Project started in 2015 as "Disney Private Blockchain Platform". The platform was released as open source project in October 2016. ICO raised $13 million in October 2017	Developers of Bitcoin Dark moved over to working on Komodo and allowed holders of BTCD to swap it for KMD. The new project started from a fork of ZCash. ICO concluded in November 2016 and raised almost $2 million.
Cross-chain interoperability	Yes	Atomic swaps - All tokens in the ecosystem can be traded in atomic swaps with coins that can support the Bitcoin hash function, i.e. Bitcoin Core based currencies. This is around 95% of cryptocurrencies at present. Etomic swaps - A bridge between Ethereum-based and Bitcoin-based currencies. All swaps are done through BarterDEX and can optionally be funneled through Jumblr for anonymity.
Use of multiple blockchains within one system	Each company can have its own blockchain.	Each project on Komodo is on its own independent blockchain. They are connected into Komodo ecosystem through atomic swaps.
Privacy		Privacy through zk-Snarks. User can decide if a transaction should be private or not. Tumlber service called Jumblr can be used
Decentralized exchange		BarterDEX, through which Atomic and Etomic swaps are conducted. On it, a problem of low liquidity that DEXes often have, is solved by producing Liquidity Provider Nodes. The nodes help to stabilize the market price by buying and selling assets across the spread in the order books.
Adoption facts, partnerships		Syscoin, Monaize

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Similar to	Enterprise-focused platforms such as Stratis, Neblio. Platforms such as Lisk and Ardor, which allow people who are not proficient with blockchain to easily create their own blockchain. Platforms that allow to connect different blockchains together: Aion, Ark, Wanchain, ICON and Polkadot.	Wanchain and NAV coin , which will also have anonymous smart contracts.

Komodo's composable design makes it an ideal choice for a wide range of blockchain projects and decentralized applications, including fintech solutions, supply chain management, digital identity and records, voting, gaming, & more[6]. Komodo is a part of SuperNet, a community focused on decentralization. Komodo is the holder of KMD economy.

V. CONCLUSIONS AND FUTURE SCOPE

New digital ecosystems, microservices, containerization and serverless technology are poised to have a big impact on design and usage of new blockchain variations that stem from emerging needs. Embracing digital platforms doesn't simply reduce costs and overhead on hardware for businesses, but also promotes a business model that focuses on long-term growth, value creation and relationship building.

The community of decentralization enthusiasts is somewhere between blockchain 2.0 and 3.0 and moving towards 4.0 now. Traditional Bitcoin/Etherium approaches are not in a position to satisfy the demands of the growing industry requirements but innovative projects and new standards keep emerging. Further blockchain 4.0 and blockchain 5.0 systems features look highly promising. The main trend for years ahead should include the integration of centralized companies and blockchains.

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