BPTrends ARTICLE

Block CHAIn amidst CHAIn OF THINGS – A NEXUS OF INFINITE POTENTIAL

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March 6, 2018

Gone is the era when the business chanted "Ask and ye shall be given" and we welcome the dawn of this new era where the customers chant "Offer before we start to seek". To stay in business, Enterprises today have to be extremely proactive, understanding, predicting and responding to customer needs prior to the customer even being aware of them.

So what has caused this shift?

This is an era of Connected Devices, one in which devices are constant companions of the customers, endlessly streaming information about them. With astounding developments in the fields of Block Chain, Big Data, Artificial Intelligence and Machine Learning, harnessing this information - gleaning intelligence from them, and driving proactivity has become an affordable opportunity for the Enterprises.

This Article is an examination of the interesting possibilities of how Block Chain amidst Chain of Things (IoT), powered by AI/ML, acts as a key differentiator, which can be leveraged by Enterprises to take their customer service to an elevated plane. It also examines some of the key aspects IT needs to consider in creating effective strategies to enable this Nexus of Infinite potential to delight their customers.

INTRODUCTION

Case 1:

The ventilator went dead as the sudden power shutdown occurred, but not before it sent an SOS. The patient under the ventilator was fighting for precious minutes. Meanwhile 2 blocks away, the Solar Panel of the empty house, whose members were on vacation, was diligently accumulating energy under the hot burning sun when the SOS arrived. Immediate transfer and distribution of power was initiated and the ventilator came alive.
A PRECIOUS LIFE was saved!!

Case2:

The whole day was a big blur!!You had been going from one meeting to another with hardly time for a bite of lunch. In the back of your mind, you had a sense you were missing something. After a few more meetings, you were heading home. On the way, it came in a flash, 'Yes, it's Mother's Day,' and you tried in vain to remember your mom's favorite flowers. But then all you had to do was command "Alexa*, Deliver Mom's favorite flowers to her"...Your genie worked!!Half an hour later you were on a video call with your mother. She had a lovely bunch of Daffodils – Yes, Daffodils were her favorite.
And there were TEARS of JOY in her eyes!!

Case 3:

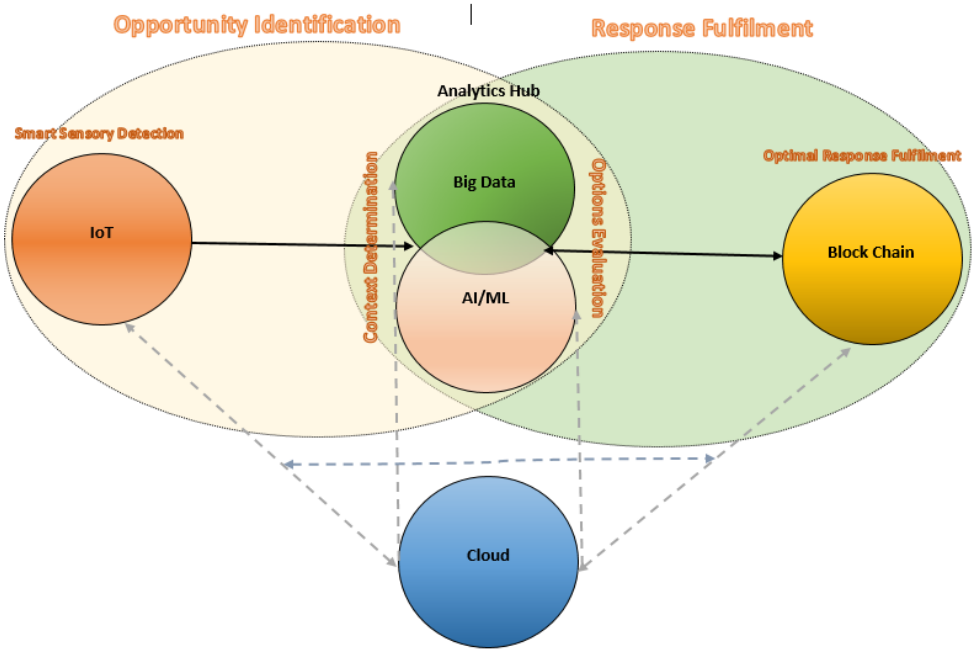
It started as a quiet night in the Lake View Residential complex and everyone was peacefully asleep. Like all things lethal the breach in the nearby lake reservoir occurred silently!!Unknown to the residents the water levels were slowly but surely rising in the vicinity. Meanwhile the diligent water level sensor was churning away data which was picked up miles away in the meteorological station. When electricity gave away and the residents awoke to their flooded night in panic, they were greeted by blaring helicopter siren offering rescue.

And what a SIGH of RELIEF in their panic stricken faces!!

Welcome to the world where the Chain of Things (Iot*) operating amidst block chain*, regulated by smart-contracts*, powered by Machine Learning*, weaves an extensive web of connected devices, at your command, communicating with each other, foreseeing, predicting and meeting your needs before you're even aware of them.

A NEXUS OF INFINITE POTENTIAL – A Genie at work

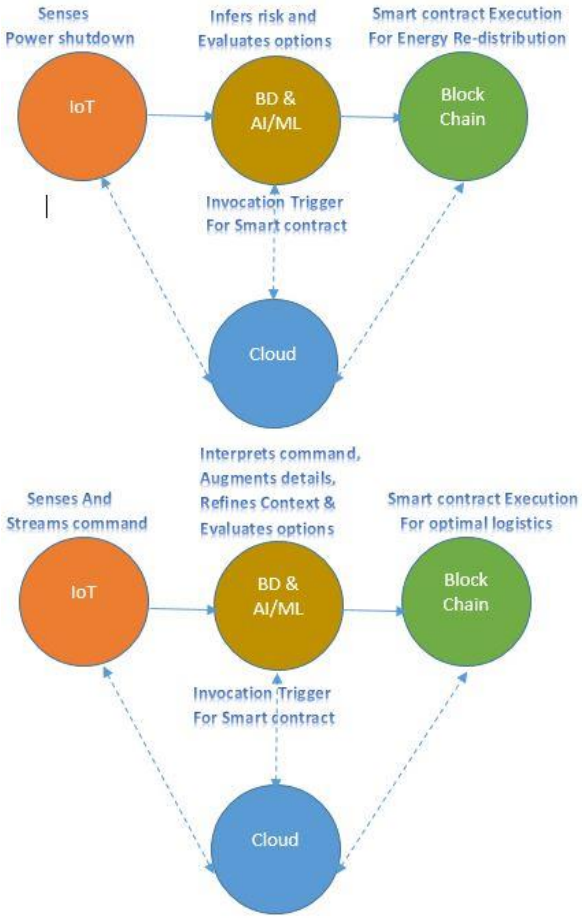
Let's examine the above 3 scenarios and understand how Block chain operating amidst the Chain of Things, aided by machine learning, helped translate the language of sensors into meaningful smart instructions, which, when bound by smart contracts, proactively came to assist.



The smart sensors streamed information about the changing physical environmental conditions, it monitored, aiding smart sensory detection.

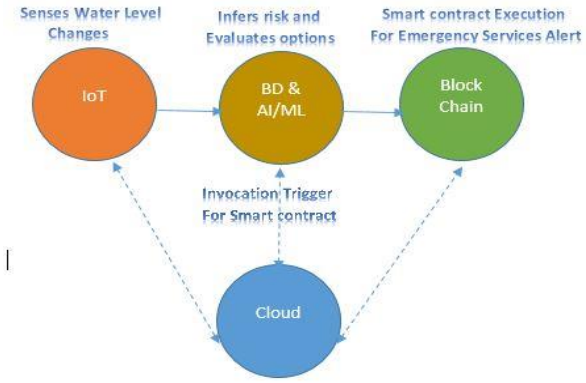
This stream of information - BIG DATA got collected and analyzed in the ANALYTICS hub aiding context determination. The context determined evaluated against previous insights gathered and projected using the predictive models of Machine Learning, helped with predicting outcomes and evaluation of response options.

Once response determined and evaluated, they were then posted for optimal fulfilment in the block chain network, regulated by smart contracts.



Case1

Case 2



Case 3:

ACTIONING THE DATA – KEY STAGES

The figure above indicates how the whole ecosystem of smart devices-IoT, Big Data/Analytics, AI/Machine Learning and Block chain, worked like a genie and helped not only to capture all of the data, intelligence and insights we needed, but also provided the ability to act on that intelligence in real time and drive actions that please the end customer.

This complete service cycle where data is transformed into actions can be said to be broadly composed of 2 key stages

- Opportunity Identification
- Response Fulfilment

Now let's examine the 2 key stages involved in this cycle of magic and understand the major interplay of the components and their associated key characteristics.

Opportunity Identification

Nothing is more expensive than a lost opportunity

A good opportunity is seldom well presented and is easily lost. An intelligent business is one which invests in proactively gleaning these not so well presented opportunities from the overwhelming mass of data to surprise and pamper their customers. The interweaving of the Smart devices, Big Data/Analytics and AI/Machine Learning form the Connected Intelligence network that helps to spot and seize opportunities to differentiate and lead.

The key characteristics of the Connected Intelligence Network include

- Data collation – Extraction of relevant data
- Data Aggregation - Ability to connect the dots
- Data Analytics/Modelling - Gathering insights
- Predictive Analytics - Superimposed on previous insights/deductions

This stage can be further broken down into 2 sub stages

Smart Sensory Detection –

Extraction of the streamed data from its source, the IoT device, and its propagation to a central hub of data collation over the internet. In certain cases, block chain may well be the medium of transmission of IoT data due to its inherent characteristics of scalability, security and immutability

Context Determination-

Gleaning of intelligence by the aggregation of all of the data at-rest and in-motion to identify unique perspectives/opportunities on business operations.

RESPONSE FULFILMENT

Opportunities are only good intentions if not translated into optimal execution

An opportunity, even a great one, doesn't implement by itself. An intelligent business invests not only in opportunity identification but also in sound decisioning systems which help to evaluate various response options for an opportunity identified, and also execute the chosen response in an optimal manner. The interweaving of the Analytics, AI/Machine Learning and Block chain form the Connected Execution network that helps to evaluate various response options and execute the chosen option in an optimal way.

The key characteristics of the Connected Execution Network include

- Predictive Analytics – Decisioning Systems
- Performance Efficiency
- Cost Optimization

Scalability

Execution Credibility
- Trustworthy
- Binding
- Immutable

This stage can be further broken down into 2 sub stages

a. Options Evaluation
b. Optimal Response Fulfilment

Options Evaluation –

Automated evaluation of response options, by decisioning systems, using machine learning models, based on past insights/deductions once the opportunity context is identified.

Optimal Response Fulfilment-

Optimal execution of the chosen option utilizing the Block chain network regulated by smart contracts.

A Genie AT WORK – Understanding the WHOle ecosystem

Now let's inspect each of the major innovations, IoT, Big Data, AI/Machine Learning and Block Chain, involved in this service cycle, and understand how they interact with each other to create the cycle of magic. Let us also examine the key aspects the enabling IT needs to consider in creating effective strategies that could exploit this nexus of infinite potential to transform and leverage it as a key business differentiator, providing superior service to customers.

The following diagram illustrates some of the common inter relational dependencies when IoT, Big Data, AI/ML and Block Chain come together.

Considerations for the ENAbling IT

Let's answer the famed W (4) H questions, What, When, Where, Who and How, at each major component level, to examine the major considerations for IT, in developing their strategies and architecture, to enable and utilize this Nexus of Infinite potential.

IoT		
	Requirements	**IT Considerations**
What	What device data needs to be collated	Data Analysis – Spectrum of IoT data to be collated - Trend Analysis - Complete IoT Data streams to analyse and spot trends - Outcome driven specific device data collation - Predictive model utilising specific IoT inputs
Where	Where is the device data to be stored	Data Storage needs for IoT Data streams i.e. Cloud, On premise Big Data stores, Edge data stores
When	When do we need to stream data	Real-time data streaming (or) Message Queues (or) latency tolerant batch transmission - IoT data interfaces
Who	Who acts on the data	Consumers of the Data - Data scientists - Trend analysis - Decisioning Systems - AI/ML
How	How is this data to be transmitted and received	Medium of data transmission and ingestion – IoT Data platforms, Block Chain, Kinesis, Apache Kafka - Determination of the transmission medium, based on the data being streamed, weighed by cost and medium characteristics like scalability/speed/security/reliability

Big Data		
	Requirements	**IT Considerations**
What	What enterprise data needs to be collated	Business and Data Analysis - Enterprise data augments device data for context determination - Trend Analysis – Spectrum of Enterprise data to analyse and spot trends - Outcome driven specific Enterprise system data collation - Predictive model inputs
Where	Where is the data to be collected	Data Storage needs for Big Data i.e. cloud, distributed big data stores -Hadoop, Redshift(columnar databases), NO SQL and relational databases, centralised or decentralised storage
When	When do we need to collate data	Real-time data transmission (or) Message Queues (or) latency tolerant batch transmission - data interfaces to-from various Enterprise Systems
Who	Who acts on the data	Consumers of the Data - Data scientists - Trend analysis - Decisioning Systems - AI/ML
How	How is this data to be transmitted	Medium of data transmission - MQ , Batch Interfaces - Determination of the transmission medium, based on the data being streamed, weighed by cost and medium characteristics like scalability/speed/security/reliability

AI/ML		
	Requirements	**IT Considerations**
What	What does the AI/ML model accomplish	Predictive Models - **BI powered by AI**. Correlate and Model available data to solve business problems - What business problems can be modelled - What business outcomes can be predicted
Where	Where is the AI/Model to be embedded	Processing – Is it at - The Edge(device Edge) - Central Hub(Central Decisioning Systems)
When	When do we invoke specific actions based on AI Prediction	AI/ML Decisioning Systems - Determination of invocation triggers - Context Determination - Interplay of different parameters and inputs - Mapping Response Actions to identified Context - Understanding the trends associated with the business problems.

Who	Who impacts, are impacted by the AI/ML model	All the business parties involved in the model - Business Partner systems – Interfaces and Key data inputs - Business Partner Networks and External Block chain networks
How	How is this model to be trained	Identification of appropriate training methodology for the models, based on training data availability and nature of the business problem to be solved, to improve their predictive capabilities – - Supervised learning – Linear Regression, Support Vector - Unsupervised learning – K Means Clustering, hierarchical clustering – Trend Analysis - Hybrid Approach - Deep learning

Block Chain		
	Requirements	**IT Considerations**
What	What is the goal of the smart contract	- Definition of business service to be executed as a smart contract - Exposing smart contract as a service
Where	Where to host the smart contract	- Permissioned or public block chains, - Different platforms - Solidity, Ethereum, Hyper Ledger - Cloud block chain offerings - Azure Block chain or proprietary block chain networks
When	When does the smart contract get triggered	- Business process definition - events and conditions which start the execution of smart contracts - AI/ML triggers to the smart contracts - Event driven Smart contract Interfaces between the AI/ML Decisioning models and Block chain
Who	Who are the various parties involved	All the business parties involved in the model - Business Partner systems – Definition of API - External Block Chain Networks – Definition of Smart Contract interfaces
How	How is this contract to be executed	• Distributed transaction support between block chains and enterprise systems • Block chain cryptography to ensure data security • Cross block chain coordination: Asset or token transfer between different networks and platforms

FuTURE – ARE WE READY TO BE 'SMART'??

As we have seen, Block chain amidst Chain of Things, powered by AI/ML, weaves its cycle of magic, with the Chain of Things aiding Smart Opportunity Identification and Block chain securing Optimal Action Fulfilment. Utilized properly, this nexus aids the design of an almost self-governing world, a fantastic possibility, where threats and risks are not only proactively detected, but mitigated as well. Are we SMART to gear up and get our IT strategies in place to leverage this Nexus of Infinite Potential and create a SMART Connected World of SMART machines?

Resources

- Courtesy Wikipedia & Internet articles

Alexa* - ***Alexa*** *is an intelligent personal assistant developed by Amazon. It is capable of voice interaction, music playback, making to-do lists, setting alarms, streaming podcasts, playing audiobooks, and providing weather, traffic, and other real-time information, such as news. Alexa can also control several smart devices using itself as a home automation system.*

IoT - *The Internet of Things (IoT) is the interconnection of uniquely identifiable embedded computing devices within the existing Internet infrastructure. Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine communications (M2M) and covers a variety of protocols, domains, and applications.*

Block Chain *– A digital ledger in which transactions made in bit coin or another crypto currency are recorded chronologically and publicly. Block chains are "an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way. The ledger itself can also be programmed to trigger transactions automatically."*

Smart Contract - *Essentially, smart contracts are instructions written in computer code that automatically execute when certain criteria are met, using block chain technology to record and execute the transaction. No intermediaries are necessary to confirm the transaction.*
Machine Learning- Machine learning *is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed.* ***Machine learning*** *focuses on the development of computer programs that can access data and use it learn for themselves.*

Wikipedia
https://dzone.com/articles/the-relationship-between-big-data-and-iot
https://azure.microsoft.com/en-in/blog/introducing-enterprise-smart-contracts/
And various other articles and blogs in the internet on IoT, Artificial Intelligence, Machine Learning and Block Chain

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