



ANALYTICS EXPERIENCE
2017

Blockchain Analytics

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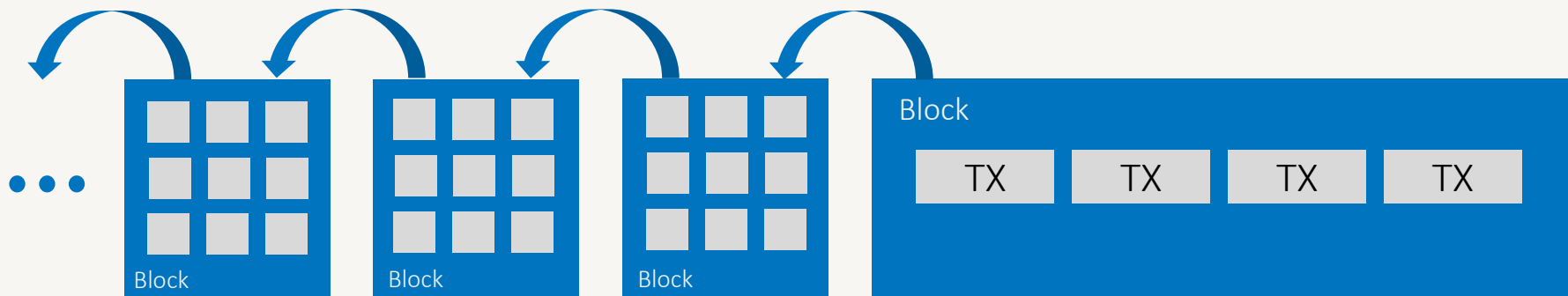
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Overview

- What are they?
- Types of Blockchain
- Format
- SAS Perspective
- Recent Blockchain Activities

What are blockchains?

- Immutable ledger/data store that maintains anything of value
- Link list of blocks that contain a link list of transactions
- Secured by asymmetric cryptography and hashing
- Many variants of blockchains
- Two key types – Public and Private/permissioned



Types of Blockchain

- Public Blockchains
 - Cryptocurrencies (Bitcoin, Ethereum, Ripple, Litecoin)
 - Distributed on WWW
 - No single point of failure
 - Anonymous/Pseudonymous Identity
- Permissioned/Private/Shared Blockchains (Hyperledger, Chain, R3 Corda)
 - Implemented inside of company firewalls
 - Shared cryptographic databases
 - Know identity
 - Lots of POC projects (Banks, Healthcare, Supply Chain)

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Types of Blockchains

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- Lots of POC projects
 - (Finance, Healthcare, Government)

Structure/Format

- Variety of Blockchain Technologies
 - Hyperledger, R3 Corda, BigchainDB, Bitcoin, Chain, etc.
- Challenges
 - All blockchain technologies are different for the most part
 - Smart contracts?
 - Various levels of encryption
 - Customers implement IP on top of open source blockchains
 - Analytics and performance measurements are limited

What's the big deal?

- **Regulatory**

- 866+ cryptocurrencies, Market Cap 147B+, BTC 48%
- China and Japan pushing KYC and AML requirements for cryptocurrencies
- 27 states in US working on regulation
- Fraud detection

What's the big deal?

- Blockchain projects
 - Consortiums
 - Hyperledger - Equities, Bonds, Securities lending, foreign exchange, credit derivatives, supply chain
 - R3 Corda - Bonds, Syndicated loans, government
- DLT Investments
 - Microsoft, IBM, PWC, AWS, Deloitte, Accenture, Ernest Young, Intel

SAS Perspective

- Blockchain Access
 - Two blockchain perspectives
 - SAS Viya access and analytics to static immutable data
 - SAS ESP Stream based blockchain analytics
- Different then SQL data store
- Permissioned Blockchains typically using NoSQL key/value data stores
- IoT into blockchain will require a streaming based solution
- Focusing on regulatory requirements and Analytics

Blockchain Approach

How do we integrate analytics into the various blockchain technologies?

- Reviewed various blockchain technologies
 - White papers
 - Downloaded and compiled Hyperledger, Ethereum, R3 Corda, Bitcoin, Litecoin, BigchainDB
- Focused on “permissioned” blockchains
- At the end of the day
 - Which blockchain technology?
 - Limited/No inherent analytic capabilities
 - IoT support?
- Need non-intrusive form of analytics that tracks activity events from clients, miners and consensus as well as selected blockchain content reporting

Approach

How about a stream based blockchain?

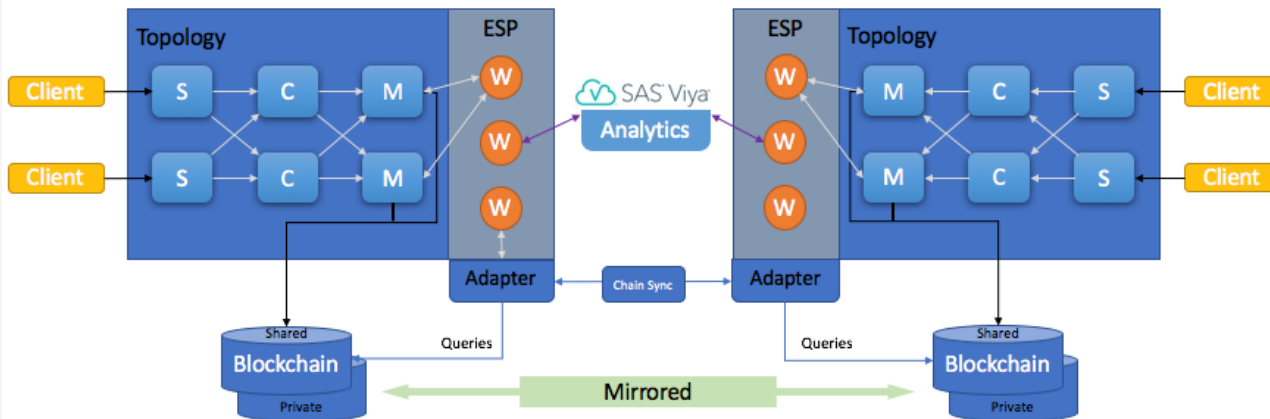
- High throughput – real time
- Pluggable topologies for clients/miners
- 100% cluster based
- Analytics by design
- Smart contracts?
- Protocol defined by streaming engine
- SAS/ESP
 - Streaming data quality and analytics
 - Complete multiphase analytics
 - In-stream learning models - Train, Score, Calculate...

Blockchain Goals

- Implement a pluggable blockchain using SAS/ESP
 - Clients/Miners/Consensus pub/sub to SAS/ESP
 - Develop a SAS/ESP analytics model that handles consensus and analytics from conception
 - Use a similar approach by adding stream events in clients/consensus of other blockchain technologies
 - Use open source technologies

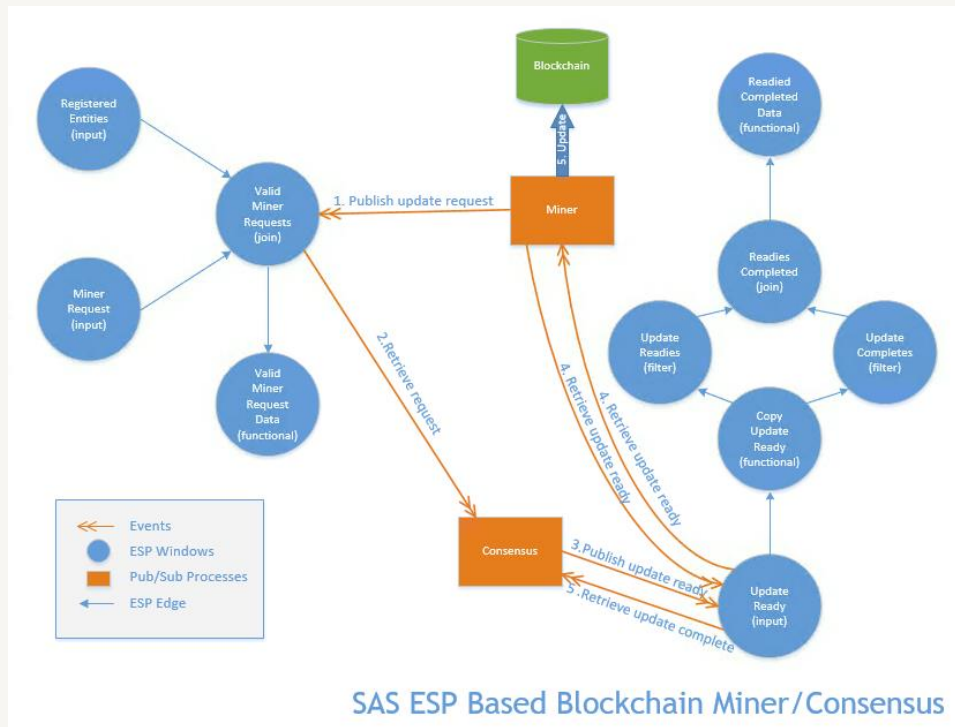
Stream Based Blockchain Architecture

Distributed Stream Pluggable Blockchain Architecture



- High Throughput
- Use based Pluggable
 - Topologies
 - ESP Model
- 100% Cluster based
- Shared/Private blockchain
- Analytics by design
- Smart Contracts via DS2->ESP

SAS/ESP Model



SAS ESP Based Blockchain Miner/Consensus

Blockchain Activities

- Bitcoin/Litecoin
 - Read the blockchain into SAS
 - Basic analytics
 - Imported into SAS Visual Investigator
- Hyperledger, Ethereum, R3 Corda, BigchainDB, Chain
 - Downloaded, compiled and analyzing
- SAS ESP Consensus Simulator
 - Build streaming based analytics for blockchain activities

Summary

- Demo...
- Continue to view and analyze blockchain technologies
 - Regulatory updates
 - Analytics support
- Update Streaming SAS/ESP blockchain model
 - AI/Machine Learning
 - Text Analytics
- Thank-you for listening

Questions?

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Innovation Hub

HUB HOURS

- Monday September 18th - 12:30 PM - 6:30 PM
- Tuesday September 19th - 7:00 AM - 5:30 PM
- Wednesday September 20th - 7:30 PM - 2:00 PM

ANALYTICS EXPERIENCE 2017

Sept. 18 - 20 | Gaylord National Resort, Washington, DC



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