Microsoft mission

Empower every person and every organization on the planet to achieve more
Microsoft Excel 1.0 was released for the Mac in 1985. It didn’t appear on Windows until 1987, after Windows 2.0 had been released. Excel was actually Microsoft’s second attempt at a spreadsheet program; it followed the relatively successful Multiplan, a spreadsheet program that was ported to a variety of systems such as MS-DOS, Apple II, Commodore 64 and more.

Image by Mike Koss.
Multi-device

Artificial Intelligence

Serverless

Intelligent Cloud

Intelligent Edge
Why Blockchain?
What if you could have one trusted, transparent and immutable record of truth between all participants in a transaction and across businesses?
If you are asking "isn't this just a database, and if so, why do I need blockchain?" It's just a phase, you'll grow out of it...
What is blockchain?
Blockchain is a secure, shared, distributed ledger

Secure
Uses cryptography to create transactions that are impervious to fraud and establishes a shared truth.

Shared
Blockchain value is directly linked to the number of organizations or companies that participate in them. There is huge value to even the fiercest of competitors to participate with each other in these shared database implementations.

Distributed
There are many replicas of the blockchain database. In fact, the more replicas there are, the more authentic it becomes.

Ledger
The database is “write once” so it is an immutable record of every transaction that occurs.
Smart Contracts

Smart Contracts are objects available on some blockchains. They allow agreements between parties to be reduced to code, variables and properties, that can be published to a blockchain, promising for multi-party contracts, and processes.
What makes this special / challenging?
Blockchain is a secure, shared, distributed ledger

Shared
- Business Logic
- Network
- SLA
- Governance
- Code
- DevOps
- RunTime
- Security
...

Special
- Immutable Business Logic
- Network tx/sec variability
- SLA of?
- Governance code updates
- Governance participants
- Code
- DevOps
- RunTime rules
- Security requirements
...

...
Not just technology – consortia considerations

Member Selection
Type of Formation
IP Ownership
Governance
Identity Federation
Network Federation
Source Code Control
Technology Selection
What’s Possible Today
Blockchain can drive significant business value

Blockchain can bring greater transparency, security, and efficiency in our current business processes eliminating inefficiencies. It can enable new business models based on distributed marketplaces and technology.

1. **Eliminates Intermediaries**
   - Allows industries to redefine or create new business models.

2. **Reduces Fraud related to data integrity**
   - Highly secure and transparent, making it nearly impossible to change historical records.

3. **Increases Efficiency and Speed**
   - For transactions involving multiple parties in a trustless environment it enables T+Zero settlement time.

4. **Reduce counterparty risk**
   - Smart contracts enable “trustless” transactions between multiple parties.

5. **Increases Revenue and Savings**
   - Potential savings and new revenue opportunities through more efficient processes and reduced costs.
## Key Value Drivers for Blockchain Use in Business Scenarios

<table>
<thead>
<tr>
<th>Value Driver</th>
<th>Detail</th>
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<tbody>
<tr>
<td>Operational simplification</td>
<td>Blockchain reduces / eliminates manual efforts required to perform reconciliation and resolve disputes</td>
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<tr>
<td>Regulatory efficiency improvement</td>
<td>Blockchain enables real-time monitoring of activity between regulators and regulated entities</td>
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<tr>
<td>Counterparty risk reduction</td>
<td>Blockchain challenges the need to trust counterparties to fulfill obligations as agreements are codified and executed in a shared, immutable environment.</td>
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<tr>
<td>Clearing and settlement time reduction</td>
<td>Blockchain distintermediates third parties that support transaction verification / validation and accelerates settlement.</td>
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<tr>
<td>Liquidity and capital improvement</td>
<td>Blockchain reduces locked-in capital and provides transparency into sourcing liquidity for assets</td>
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<tr>
<td>Fraud minimization</td>
<td>Blockchain enables asset provenance and full transaction history to be established with a single source of truth</td>
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### Common Characteristics of High Potential Use Cases

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Example</th>
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</thead>
<tbody>
<tr>
<td>Shared repository</td>
<td>A shared repository of information is used by multiple parties. Ledger that stores financial assets in which an owner and owned assets are tracked and shared with other internal/external parties (e.g. regulators and other geographical units)</td>
</tr>
<tr>
<td>Multiple writers</td>
<td>More than one entity generates transactions that require modifications to the shared repository. Payments system collectively managed and maintained by a small group of banks, but each bank has millions of end users transacting with their bank</td>
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<tr>
<td>Minimal trust</td>
<td>A level of mistrust exists between entities that generate transactions. Multiple parties within a trade finance arrangement (e.g. importer, exporter, issuing bank, receiving bank, correspondent banks and customs) that do not “trust” each other and, therefore, institute layer of verification and impose collateral requirements.</td>
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<tr>
<td>Intermediaries</td>
<td>One (or multiple) intermediary or a central gatekeeper is present to enforce trust. Removing and/or reducing the importance of a central intermediary whose primary role is to provide “trust” to the post-trade ecosystem.</td>
</tr>
<tr>
<td>Transaction dependencies</td>
<td>Interaction or dependency between transactions is created by different entities. A situation in which Alice needs to send funds to Bob, then Bob needs to send funds to Charlie. Bob’s transaction is dependent on Alice’s transaction, and one cannot verify Bob’s transaction without checking Alice’s first.</td>
</tr>
</tbody>
</table>
95%
Building an end-to-end blockchain app is a huge undertaking

- Deploy gateway API
- Manage pre-processing and storage
- Choose services to integrate with
- Create oracles
- Manually deploy ledger on a network
- Integrate with identity and key mgmt services
- Integrate with existing business apps
- Manage post-processing storage
- Build web client
- Perform post-processing compute
- Test & debug
- Configure consensus algorithms
- Write business logic
- Retrieve reference data
It’s hard to bridge the gap and deploy blockchain in your business

[Diagram showing existing SaaS tools and enterprise ledgers for organizations 1 and N]
## Challenge
- Reducing supply chain management costs associated with one of their flagship confectionary products while also making it easier for customers to see the journey of the product from farm to fork.

## Strategy
- Design a blockchain solution to give them real-time visibility into their supply chain.

## Results
- Blockchain technology engaged the tactical and strategic angles of the supply chain to reduce costs, ensure quality, and increase revenue.
- Enhanced visibility into their confectionary export process and improved their ability to address inefficiencies and resolve disputes involving both suppliers and consumers.
Supply chain provenance and tracking

Multiple sources of grain, multiple phases where lots are split or aggregated, and multiple lots over the journey. All lots get a hash (digest) based on lot id + farmer id. Hashes of aggregations include the hashes of all those that came before it.

With blockchain, parties can have visibility into a digital track of retail product’s development including:

- Source of the product materials
- How, where and in what conditions the product was manufactured
- How, where and in what conditions the product was transported

Track product
Verify authenticity
Anti-counterfeit
Anti-tamper
Economic empowerment for farmer

Digests Creating During Processing
0x23e423s3234...
0x4e231323134...
0x98d2a323418...

Retail Bag Digest
0x48e423s3234...

All digests of lots from prior step in the supply chain are combined into one unique digest for the retail product.
At various points in the journey, an IoT device scans the product and records its status and condition which are updated on the blockchain.

**Farmer**
- Plot #839049
- 25 tons of cocoa beans
- Certifications

**Carrier**
- Shipped 2/5/2018
- Organic
- Fair Trade

**Manufacturer**
- Delivered 2/12/2018
- Organic
- Fair Trade

**Distributor**
- Delivered 2/19/2018
- Organic
- Fair Trade

**Retailer**
- Delivered 2/26/2018
- Organic
- Fair Trade

**Customer**
- Guaranteed fresh
- Certified organic
- Certified Fair Trade

Consumer visibility
The package has to be maintained at:

- Temperature < 10º C
- Humidity < 65%

At various points in the journey, the IoT device from the package sends the Temperature & Humidity values which are recorded on the blockchain.

The conditions of the contract have been violated. Carrier 2 is liable for penalty as the temperature of the package while in transit to the retail store was above the prescribed limit.

At various points in the journey, the IoT device from the package sends the Temperature & Humidity values which are recorded on the blockchain.
Validate your product’s authenticity

**Challenge**

- 3M sought a solution to reduce tampering and prevent the introduction of counterfeit drugs into the pharmaceutical supply chain – which is a $200 billion criminal industry
- Counterfeit drugs negatively impact brand reputation and overall revenue but, ultimately, they hurt unsuspecting customers

**Strategy**

- 3M and Microsoft leveraged Azure Blockchain to build an innovative service to track specially labeled packages through any supply chain
- Multilayer QR code labels were used to expose tampering and facilitate easy tracking

**Results**

- Blockchain technology improved visibility and security at each transfer to ensure products are authentic and free of tampering
- Real-time registry, validation, and custodial recordings combated counterfeits and eliminated the risk of fraudulent double selling through secure, attestable data

“We combined 3M DoubleTrust tamper-evident labels with Azure Blockchain to create a label-as-a-service supply chain solution that can help identify counterfeits, protect business performance, and save lives.”

— Oscar Naim, PhD, Lead Software Architecture Specialist, 3M
At various points in the journey, the IoT device scans the QR codes and records the unique serial numbers which are updated on the blockchain. The integrity of the product has been violated. Carrier 2 is liable for penalty as the amount of Drug A when it reached the retail store was less than the Smart Contract was tracking.
Microsoft’s Blockchain Approach
Microsoft Azure Blog

Announcing Azure Pipelines with unlimited CI/CD minutes for open source

September 10, 2018

With the introduction of Azure DevOps today, we’re offering developers a new CI/CD service called Azure Pipelines that enables you to continuously build, test, and deploy to any platform or cloud.

Jeremy Epling, Principal Group Program Manager, Azure DevOps

Azure Source - Volume 49

Monday, September 17, 2018

Keep current on what’s happening in Azure, including what’s now in preview, generally available, news & updates, and more.

Rob Caron, Sr. Product Marketing Manager

Five habits of highly effective Azure users

Wednesday, September 12, 2018

There’s a lot you can do with Azure. But whether you’re modernizing your IT environment, building next-generation apps, harnessing the power of artificial intelligence, or deploying any of a million other solutions, there are foundational habits that can help you succeed.

Omar Khan, General Manager, Microsoft Azure

Introducing Azure DevOps

Monday, September 10, 2018

Today we are announcing Azure DevOps. Working with our customers and developers around the world, it’s clear DevOps has become increasingly critical to a team’s success.

Jamie Cool, Director of Program Management, Azure DevOps
Blockchain

Multi-member consortium support with Azure Blockchain Workbench 1.3.0
Monday, August 20, 2018
Continuing our monthly release cadence for Azure Blockchain Workbench, we’re excited to announce the availability of version 1.3.0. You can either deploy a new instance of Workbench through the Azure...

Zeyad Rajabi, Principal Program Manager, Azure Blockchain Engineering

Ethereum Proof-of-Authority on Azure
Tuesday, August 7, 2018
We’ve had great traction with our support of Ethereum on Azure. The existing Proof-of-Work solution has been deployed tens of thousands of times across a variety of industry verticals.

Cody Born, Software Engineer, Azure Global

Improve collaborative care and clinical data sharing with blockchain
Thursday, August 2, 2018
Currently, the healthcare industry suffers major inefficiencies due to diverse uncoordinated and unconnected data systems. Azure Blockchain Workbench addresses this challenge by allowing healthcare providers to share data securely and efficiently across the entire medical community.
Immutable storage for Azure Storage Blobs now generally available

Posted on September 18, 2018

Michael Hauss, Program Manager, Azure Storage

Financial Services organizations regulated by the Securities and Exchange Commission (SEC), Commodity Futures Trading Commission (CFTC), Financial Industry Regulatory Authority (FINRA), Investment Industry Regulatory Organization of Canada (IIROC), Financial Conduct Authority (FCA), and more are required to retain business-related communications in a Write-Once-Read-Many (WORM) or immutable state that ensures they are non-erasable and non-modifiable for a specific retention interval. The immutable storage requirement is not limited to financial organizations but also applies to industries such as healthcare, insurance, media, public safety, and legal services.

Today, we are excited to reveal the general availability of immutable storage for Azure Storage Blobs to address this requirement. The feature is available in all Azure public regions. Through configurable policies, users can keep Azure Blob storage data in an immutable state where Blobs can be created and read, but not modified or deleted.

Typical applications include:

- **Regulatory compliance**: Immutable storage for Azure Blobs is designed to help financial institutions and related industries address SEC 17a-4(f), CFTC 1.31(c)-(d), FINRA etc. A technical whitepaper with details on how the feature addresses these regulatory requirements is downloadable now via the Service Trust Portal. The Azure Trust Center contains detailed information about our compliance certifications.

- **Secure document retention**: Users receive maximum data protection as the immutable storage feature for Azure Blobs service ensures that data cannot be modified or deleted by any user including those with account administrative privileges.
We started by creating modular preconfigured templates and infrastructure.

**Ledger and topology choice**

Choose the ledger that meets your needs

Deploy on flexible topologies (dev test, single-node, or multi-node) so you can expand when you’re ready.
With infrastructure, it became apparent how hard and expensive apps were
Azure Blockchain Workbench facilitates rapid, low cost development

- Workflow execution
- Identity & key management
- Ledger-neutral approach
- Auto-generate starter apps
- Integration APIs & events
- Workflow/user admin
- Azure data integration
Azure Blockchain Workbench architecture

04/19/2018 • 7 minutes to read • Contributors

Azure Blockchain Workbench simplifies blockchain application development by providing a solution using several Azure components. Blockchain Workbench can be deployed using a solution template in the Azure Marketplace. The template allows users to pick the modules and components to deploy with Blockchain Workbench, such as blockchain stack, type of client application, and support for IoT integration. Once deployed, Blockchain Workbench provides access to a web app, iOS app, and Android app.
With an enterprise-ready, customizable approach
Architectural Pattern for Enterprises
Increased Productivity and Security

Enterprise Smart Contracts

• Security and confidence in code connecting to the blockchain
  • Secure compute
  • Secure communications
  • Attestable code
• Increased productivity and code re-use
  • Write cryptlets in popular development languages
  • Re-use existing code
  • Common code base across multiple blockchain protocols
• Performance
  • Avoid current limitations and select the hardware profile appropriate for your workload
• Multi-chain
  • Communicate across blockchain protocols
• Marketplace
  • Marketplace for attestable code and data services
Enterprise Smart Contracts

Marley Gray - Microsoft

Introduction

It has been a little over a year since we announced project “Bletchley” and since that time we have been working directly with our partners and customers trying to figure out what, "exactly" this all means? Most of us, when encountering blockchain for the first time are either trying to figure out the tech underneath or simply understand the hype. We usually don't get it, at first. It often takes several turns of the intellectual crank for it to soak in and the possibilities and opportunities to become obvious. This is due to the potential disruptive forces that could be unleashed by the implementation of what is actually off
Addressing Private Consortium Needs

Confidential Consortium Framework
• Alternative approach to ledger construction
• Addresses consortium needs such as
  • Scalability
  • distributed governance
  • enhanced confidentiality
  • security and immutability
• Leveraging the power of existing blockchain protocols, trusted execution environments
COCO RPC Request

E.g. Ethereum request:

```json
{ "jsonrpc": "2.0", "method": "eth_sendRawTransaction", "params": ["0x46e8dd567c5d32be8d46e8dd67c532be8058bb8eb970870f072445675058bb8eb970870f072445675"]}
```
Notable things to pay attention to ...

• Digital Uniqueness
  • Value/Code linkage opportunity
  • Digital Scarcity
  • Incentivization of ecosystem and network participation

• Cross domain and cross organization complexities
  • Write cryptlets in popular development languages
  • Re-use existing code
  • Common code base across multiple blockchain protocols

• Identity, Key Management
  • Custody services
  • Backup, derivation, restore, revocation

• Multi-chain
  • Communicate across blockchain protocols
54

Azure regions
The deepest and most comprehensive compliance coverage

<table>
<thead>
<tr>
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<th>ISO 27017:2015</th>
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<th>GDPR</th>
<th>Germany C5</th>
<th>Germany IT-Grundschatz workbook</th>
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<th>Japan CS Mark Gold</th>
<th>Japan My Number Act</th>
<th>Netherlands BIR 2012</th>
<th>New Zealand Gov CIO Fwk</th>
<th>Singapore MTCS Level 3</th>
<th>Spain ENS</th>
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Empower every person and every organization on the planet to achieve more