Microsoft
Blockchain As a Service

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“LEGO blocks (#0048)” (CC BY 2.0) by regan76 @ flickr
about me

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"BUSINESS(es) NEVER OPERATE in ISOLATION; They are ALWAYS Participants in a Business Network"

- Ujjwal
“Double Spend Problem”
What’s so special about blockchain anyway?
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Immutable
Consensus
Trust
Why should I care?
Potential for disruption

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

Reduces Fraud
Highly secure and transparent, making it nearly impossible to change historical records.

Increases Efficiency and Speed
Simplifies transactions and enables T+Zero settlement time.

Increases Revenue and Savings
Potential savings and new revenue opportunities through more efficient processes and reduced costs.
Consider the “Sharing Economy”

“Enabling people to share and monetize their assets, skills and time”

Airbnb – I rent out “spare capacity” in my oh-so-trendy Paris apartment
Etsy – I sell the output of my crocheting obsession
EasyCar Club – I rent out the 911 when I’m in the Lambo
Uber – I proffer my skills, time and asset for modest reward

Democratising? Undeniably yet these are centralised models...

Blockchain could potentially redefine the sharing economy

Disintermediation means lower costs, greater efficiency, greater transparency
Marketplaces become distributed applications on the blockchain
Smart contracts executing transactions
It’s not just about money
“The first generation of the digital revolution brought us the Internet of information.

The second generation – powered by blockchain technology – is bringing us the Internet of value: a new platform to reshape the world of business and transform the old order of human affairs for the better.”

– Don Tapscott
THERE HAS BEEN SIGNIFICANT GROWTH IN FINANCIAL INCLUSION

More adults have an account (with a financial institution or mobile money service) now than three years ago.

- In 2011, 51% of the world’s adult population had an account.
- In 2014, 2.5 billion people were unbanked.
- In 2014, 62% of the world’s adult population had an account.
- In 2014, 2 billion people were unbanked.

Global Findex 2014 infographic courtesy of The World Bank
How does it work?
The chain forms

Block 0 (0x23e79...)
- Genesis Block
- Transaction 3
- Transaction 2
- Transaction 1

Block 1 (0x09aa5......)
- Previous Block 0x23e79...
- Transaction 5
- Transaction 4

Block 2 (0x7b5...)
- Previous Block 0x9aa5...
- Transaction 9
- Transaction 8
- Transaction 7
- Transaction 6
Blockchain x.0
Smart Contracts

Blockchain 1.0
Simple Ledgers that record transactions

Blockchain 2.0
+ Smart Contracts
Logic Tier
Smart Contracts

Like a physical contract but terms are converted into code and loaded onto the Blockchain.

Smart Contracts enforce themselves because they live on the blockchain.

Smart Contracts react to events and messages, include complex multiparty actions and actually transfer assets between parties.

Think of a Smart Contract as a program running on the Blockchain that will continue running until it expires. This contract will leave a complete historical ledger of all of its interactions along with the identities of those interacting with it so it is completely transparent for auditing purposes.
Blockchain 1.0
Simple Ledgers that record transactions

Blockchain 2.0
+ Smart Contracts
Logic Tier

Blockchain 3.0
+ Cloud Servicing
Multilayer Middleware
+ Cryptlets

Smart Contracts
Ethereum Platform

“Next generation” blockchain – fully trustless smart contract platform

Ether is the “currency” of Ethereum
Ethereum Virtual Machine (EVM) – Turing Complete
Ethereum client eg go-ethereum (or Geth), Parity, cpp-ethereum
Ethereum wallet / Mist
Ethereum Development

Geth (client) allows us to deploy and exercise smart contracts with Solidity as the language, compiled to bytecode for deployment. Geth exposes an API over JSON-RPC, and Web3.js SDK wraps this API for JavaScript (with .NET, Java, and Ruby SDKs also available).

Truffle is a development framework, and testrpc is a local Ethereum client for testing.
Dev Cycle

Authoring (VS Code) → Truffle → Compile → Local Ethereum Node (testrpc) → Truffle → Compile → Deploy

Network Ethereum Node (Geth) → Blockchain Network

Network Ethereum Node (Geth) → Blockchain Network
Types of blockchain
Public vs Consortium

Public
Unpermissioned (eg Bitcoin, Ethereum)
Anyone has access
No single owner – all participants are “owners”
Anyone can verify transactions and consensus is used to determine “truth”

Consortium
Permissioned Public (eg Ripple)
Anyone has access
One or many “owners”
Only designated actors can verify transactions and achieve consensus

Permissioned Private (eg Bankchain)
Access to the ledger is restricted
One or many “owners”
Only designated actors can verify transactions and achieve consensus
Characteristics

Distributed, peer to peer network architecture
Cryptographic tokens
Shared database / ledger (everyone has a copy)
Blocks of transactions to start of time (genesis block)
Immutable
Heartbeat – blocks are committed
Consensus formation algorithm
Virtual machine
Consensus Forming Approach

Consensus requires participants with vested interest
  Proof of work (need to solve a puzzle)
  Proof of stake (I can demonstrate I own some stake in the system)
  Proof of burn (I’m prepared to make a sacrifice to participate)

It must come at a cost but be easy to verify (asymmetric)
Potential applications
And it will disrupt multiple industries

**Financial**
Redesign costly legacy workflows, improve liquidity and free up capital. Help reduce infrastructure costs, increase transparency, reduce fraud and improve execution and settlement times.

**Retail & Manufacturing**
Better supply chain management, smart contract platforms, digital currencies, and tighter cybersecurity.

**Healthcare**
Removes third-party verifiers such as health information exchanges by directly linking patient records to clinical and financial stakeholders. Provides fast, secure, authenticated access to personal medical records across healthcare organizations and geographies.

**Government**
Increase transparency and traceability of how money is spent. Track asset registration, such as vehicles. Reduce fraud and operational costs.
New solutions to difficult business problems

**Financial**
- Trading
- Deal origination
- POs for new securities
- Equities
- Fixed income
- Derivatives trading
- Total Return Swaps (TRS)
- 2nd generation derivatives
- The race to a zero middle office
- Collateral management
- Settlements
- Payments
- Transferring of value
- Know your client (KYC)
- Anti money laundering
- Client and product reference data.
- Crowdfunding
- Peer-to-peer lending
- Compliance reporting
- Trade reporting & risk visualizations
- Betting & prediction markets

**Media**
- Digital rights mgmt
- Game monetization
- Art authentication
- Purchase & usage monitoring
- Ticket purchases
- Fan tracking
- Ad click fraud reduction
- Resell of authentic assets
- Real time auction & ad placements

**Computer Science**
- Micronization of work (pay for algorithms, tweets, ad clicks, etc.)
- Expanse of marketplace
- Disbursement of work
- Direct to developer payments
- API platform plays
- Notarization & certification
- P2P storage & compute sharing
- DNS

**Medical**
- Records sharing
- Prescription sharing
- Compliance
- Personalized medicine
- DNA sequencing

**Asset Titles**
- Diamonds
- Designer brands
- Car leasing & sales
- Home Mortgages & payments
- Land title ownership
- Digital asset records

**Government**
- Voting
- Vehicle registration
- WIC, Vet, SS, benefits, distribution
- Licensing & identification
- Copyrights

**Identity**
- Personal
- Objects
- Families of objects
- Digital assets
- Multifactor Auth
- Refugee tracking
- Education & badging
- Purchase & review tracking
- Employer & Employee reviews

**IoT**
- Device to Device payments
- Device directories
- Operations (e.g. water flow)
- Grid monitoring
- Smart home & office management
- Cross-company maintenance markets

**Payments**
- Micropayments (apps, 402)
- B2B international remittance
- Tax filing & collection
- Rethinking wallets & banks

**Consumer**
- Digital rewards
- Uber, AirBNB, Apple Pay
- P2P selling, craigslist
- Cross company, brand, loyalty tracking

**Supply Chain**
- Dynamic commodities pricing
- Real time auction for supply delivery
- Pharmaceutical tracking & purity
- Agricultural food authentication
- Shipping & logistics management
Microsoft and blockchain
Open Platform

Accessible

Enterprise Ready
Microsoft Azure | An Open Cloud

We've delivered an open, broad, and flexible cloud across the stack.

**Infrastructure**
-ubuntu
- Core OS
- docker
- CentOS
- Oracle Linux

**Databases**
- DataStax
- Couchbase
- Hortonworks
- MySQL
- MongoDB
- Redis
- SQL Server

**App Frameworks**
- .NET
- Java
- PHP
- Eclipse
- Python
- Ruby
- IntelliJ IDEA

**Hyper Scale**
- Enterprise Grade
- Hybrid

**Azure BaaS**
- coinprism
- Libra
- bitpay
- ETH BaaS
- openchain
- ripple
- NETKI
- Manifold Technology
- MultiChain

**Applications**
- Web App Gallery
- Dozens of .NET & PHP CMS and Web apps

**Management**
- JUJU
- CHEF
- puppet labs
- ANSIBLE
- GitHub
- SALTSTACK
Tenets of our Strategy

FAIL FAST & CHEAP
in a development test environment

MIX & MATCH
from the best available blockchain technologies

CREATE & INNOVATE
by building solutions on blockchain quickly

SHARE SOLUTIONS
through a worldwide distributed platform

PROVISION
with one-click to test & iterate
**Project “Bletchley”**

- **Build and learn**
- **Develop key Azure middleware services**
- **Grow the ecosystem**

**POCs**
- Banking, Capital Markets
- Discrete Manufacturing
- Retail & CPG
- Healthcare
- Government

**Horizontal SaaS & Adapters**
- First Party
- Second Party
- Third Party

**Industry Solutions**
- Professional Services & Support
- Crypto services & architecture (secure containers, attestation, etc.)

**Middleware**
- Distributed Ledger Gateway Services
- Identity & Key Services
- Encryption Services
- ML & BI Services

**Base Platform**
- Smart Contract-Based Distributed Ledger Stacks
  - First party DL Stack
  - Third party DL stack A
  - Third party DL stack B
  - Third party DL stack C...

**Azure - Blockchain resource provider**
Create a tight feedback loop between POCs & MS engineering to enable quick iterations on our offerings

- Learn quickly, discover customer needs, and galvanize partners through POCs
- Influence and adjust Blockchain product design and roadmap

**Industry Solutions**
- Banking, Capital Markets
- Discrete Manufacturing
- Retail & CPG
- Healthcare
- Government

**Middleware**
- Distributed Ledger Gateway Services
- Identity & Key Services
- Encryption Services
- ML & BI Services
- Crypto services & architecture (secure containers, attestation, etc.)

**Base Platform**
- Blockchain Virtual Machine
- 1st party DL Stack
- 3rd party DL stack A
- 3rd party DL stack B
- 3rd party DL stack C...

**3rd party DL stack C...**

**Azure - Blockchain resource provider**
Drive partner innovation and scale by providing blockchain tools and pre-configured solutions through or marketplaces.

Promote engagement and innovation by onboarding ISVs into Azure Marketplace and AppSource. Enable customers and partners to discover, publish and transact blockchain components and services from smart contracts to complete SaaS offerings.

Azure Marketplace and AppSource with 3rd party solutions, smart contracts, and other blockchain components.
Build enterprise-ready blockchain middleware

**Distributed Ledger Gateway Services**
Provides communication between multiple Blockchain technologies/implementations.

**Identity and Key Services**
Helps with authentication, authorization, access, and lifecycle management.

**Encryption Services**
Provides encryption for blockchain transactions and fields

**Cryptlet Services**
Provides runtime for cryptlets and communication between blockchain and cryptlet trusted host

**Machine Learning and Business Intelligence**
Rich data services, such as BI analytics, auditing, and machine learning
Get started

SIGN UP FOR AN AZURE ACCOUNT
https://azure.microsoft.com/

READ ABOUT BLOCKCHAIN ON AZURE

TRY THE CONSORTIUM BLOCKCHAIN TEMPLATE

FIND OUT MORE ABOUT PROJECT ‘BLETCHLEY’
Thank you