

Blockchain Explained

DFW Blockchain Immersion Workshop

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Daniel Acosta
acostad@us.ibm.com
 IBM z Systems Software
 Public & Healthcare Sector



What is Blockchain for?

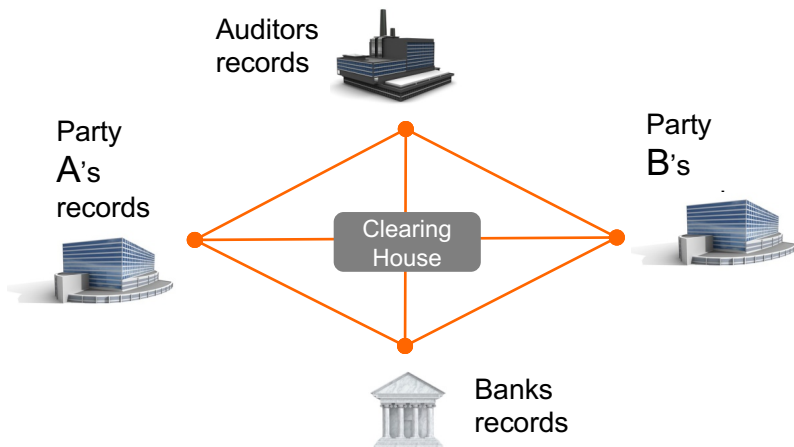
Record the state and ownership of an asset

Enable parties that do not know or trust each other to transact efficiently and faithfully

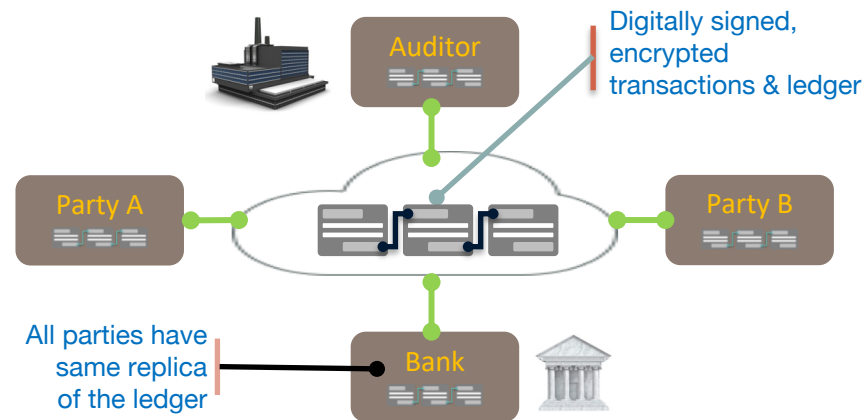
Automate contractual agreements between parties in a network

Blockchain will fundamentally change business processes

Traditional

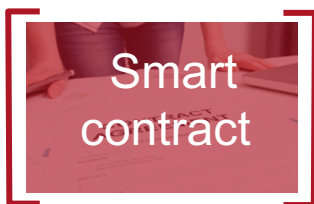
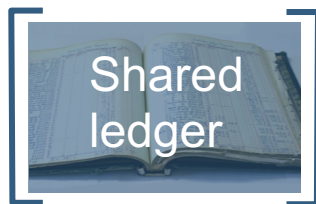


With Blockchain

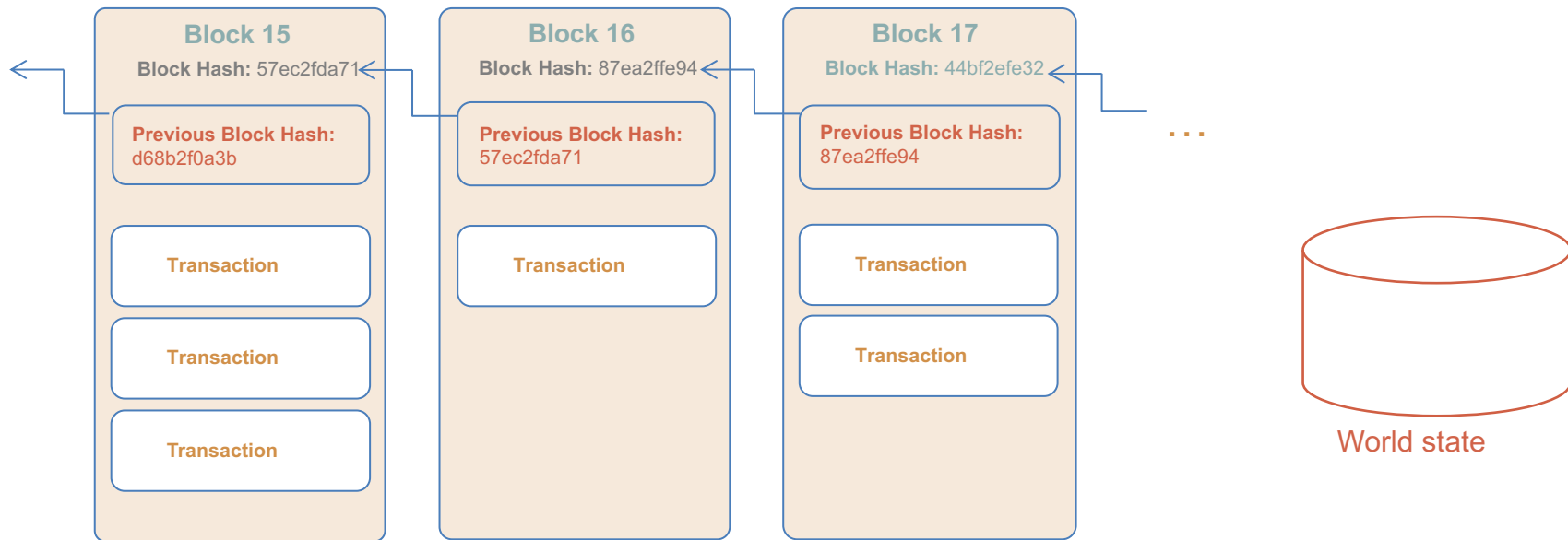


...inefficient, expensive, vulnerable

...provenance, immutability, finality

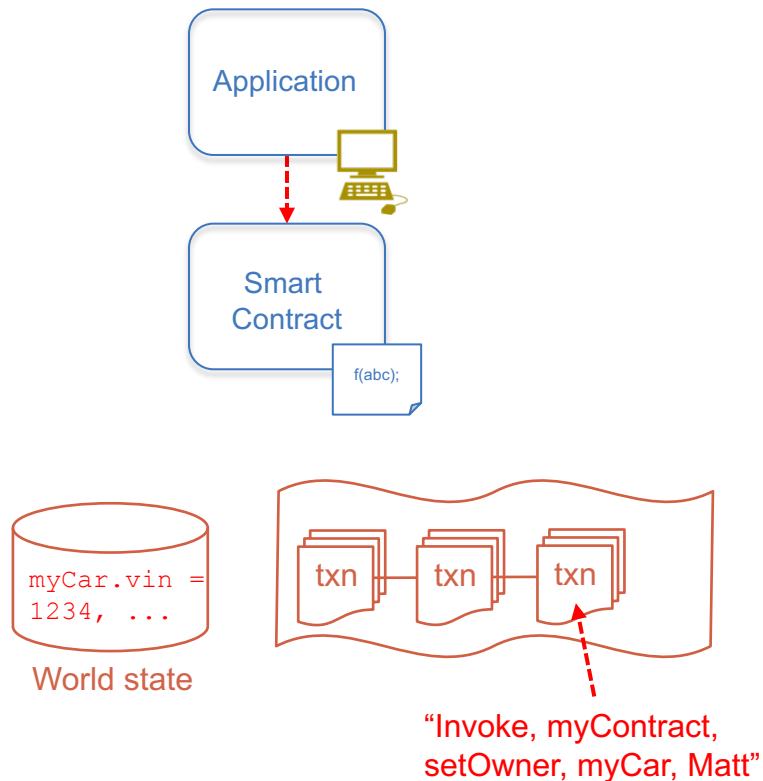


The Ledger - Blockchain and World State



- A **blockchain** is made up of a series of blocks with new blocks always added to the end. Blocks achieve immutability by including the result of a hash function of the previous block
- **World State** is ordinary database (e.g. key/value store) that stores the combined outputs of all transactions

Working with the Ledger: Example of a change of ownership transaction



Transaction input - sent from application

```
invoke(myContract, setOwner,  
       myCar, Matt)  
...
```

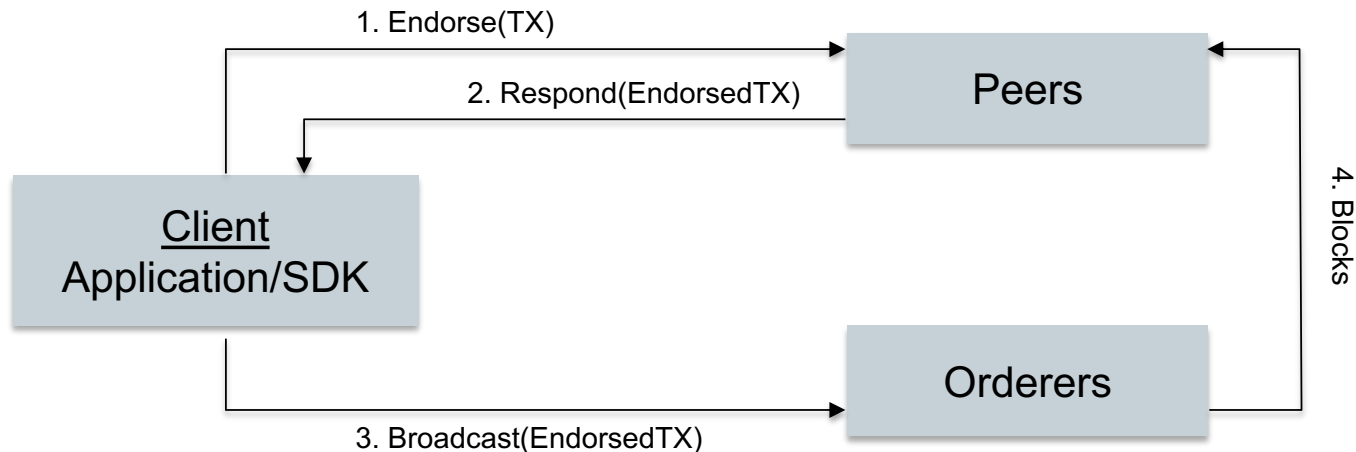
Smart contract implementation

```
setOwner(Car, newOwner) {  
    set Car.owner = newOwner  
}
```

World state: new contents

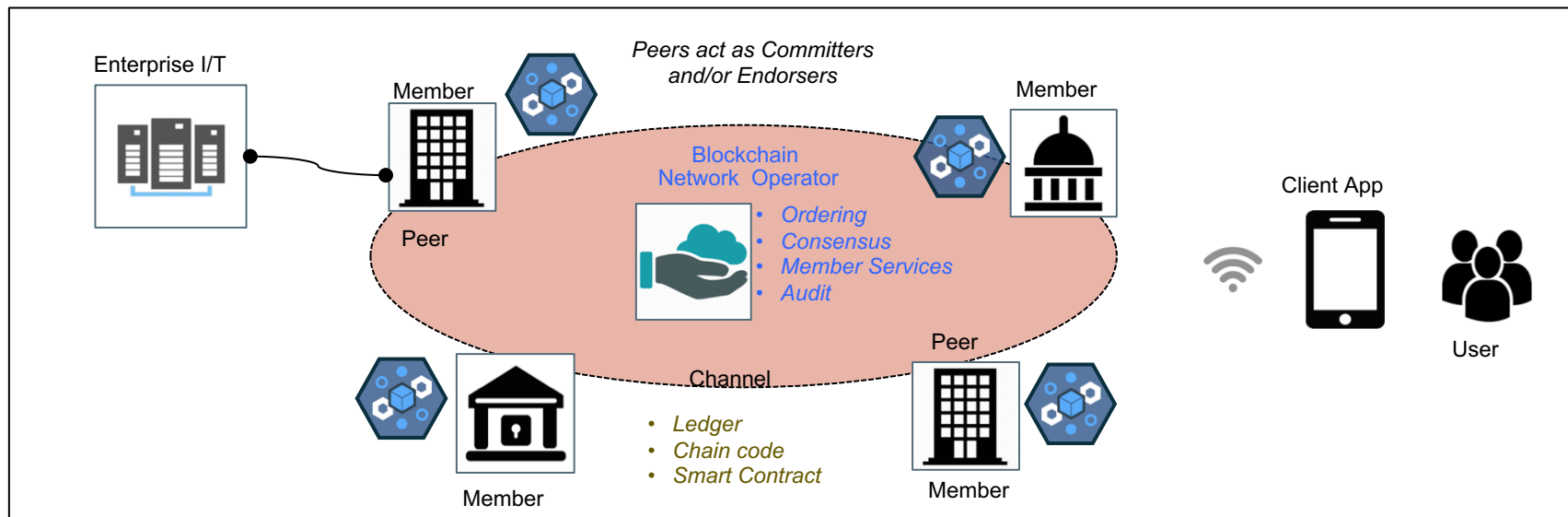
```
myCar.vin = 1234  
myCar.owner = Matt  
myCar.make = Audi  
...
```

Transaction Data Flow



1. App requests 1 or more peers to endorse a transaction, which executes the chaincode but doesn't commit the changes
2. Each endorsing peer signs (endorses) the result and returns to the app
3. App collects endorsements and sends to ordering service
4. Orderer delivers blocks to the peers (on the chain), who validate and commit blocks to the ledger

What's in a Blockchain Business Network



Roles	Key Activities	IBM Provides . . .
Member / Founder	Operates Blockchain Node & Chaincode executed against Network Ledger	Managed high availability Blockchain aaS offering
Developer	Develops Client App, Chain Code, and Integration/Connectors to Blockchain Network	Blockchain client SDK (Java, Node.js, Python, Go); Chain Code SDK (Java, Go)
Service Provider	Provides Blockchain Services or Solution Development	Education, Sample Applications & Blockchain Service APIs
Network Operator	Operates Blockchain Business Network	IBM Blockchain on Bluemix for Hyperledger Fabric V1.0

IBM Strategy – Our Vision



HYPERLEDGER

BLOCKCHAIN TECHNOLOGIES FOR BUSINESS

Open

The foundation of the industry processes, both the technology and the community, need to be open: Open source, governance & ecosystem

One of 17 founding members of Hyperledger, a Linux Foundation Project


180+ cross-industry, global companies

Hyperledger Fabric, initially contributed by IBM, is in V1.0

Trusted

Enable untrusted parties to work together **leveraging permissions** and identity, to ensure data and transactions are protected and consistent

Regulated business environments **without anonymous participants**

Blockchain ≠  bitcoin








For Business

Blockchain needs to be built in a robust technology environment providing **security, confidentiality, auditability, reliability and scalability**







IBM has a long history running the world's largest transaction systems

Blockchain Workload Indicators

Positive Indicators

-  Managing contractual relationships
-  Complex business logic
-  Identity is important
-  Transactions need to be private
-  More than two parties
-  Looking to reduce costs
-  Want to improve discoverability

Negative Indicators

-  Small organization (no business network)
-  Looking for a database replacement
-  Looking for a messaging solution
-  Looking for transaction processing replacement
-  Very high assets volumes (millions)
-  Need high performance (millisecond tx)

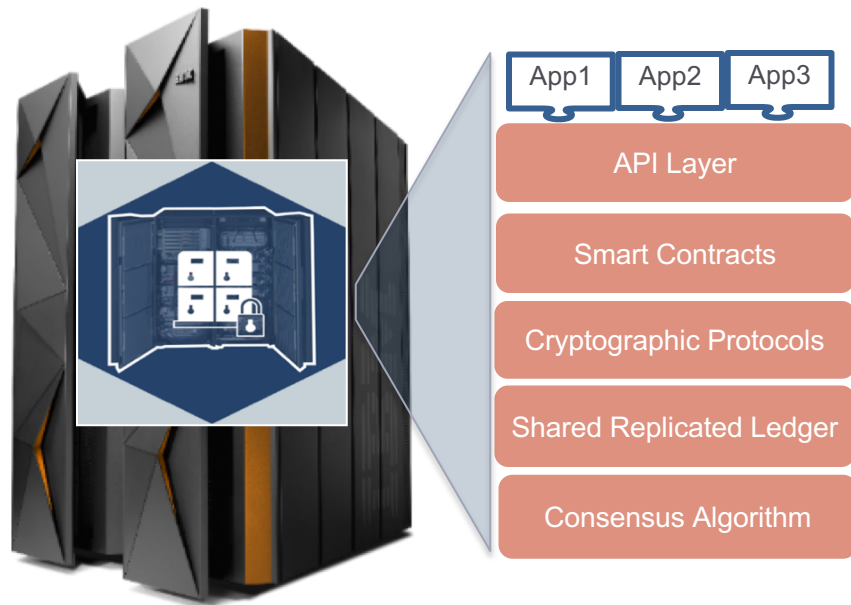
Why on Z?

Blockchain advantages on Z

Superior performance and highest industry certifications

Meets strictest requirements for:

government, healthcare, and financial services, including insurance



✓ Fastest hardware acceleration

- Hashing
- Elliptical Curve algorithm for digital signature

✓ Global Security Compliance

- PKCS11 – standard for interfacing to crypto tokens
- FIPS 140-2, Level 4 (HSM has highest level of certification)

✓ Common Criteria EAL5+ security certification

- Rigorous testing and evaluation

✓ In Memory (32 TB)

- Enables transactions to remain in memory for processing, significantly reducing latency for ledger processing

✓ Blockchain peers benefit from a High-speed, internal network (reduced latency, high throughput)

Optimized Network – 41% to 82% faster response time, 1.4x – 7x more throughput

IBM Blockchain Platform and Offerings

Develop

Developers

- ✓ Develop applications and chaincode
- ✓ Exploration and Early learning
- ✓ Get started quickly

Depending upon your blockchain journey

Hyperledger Composer Playground

free

- ✓ Web learning experience

IBM Certified Docker Images (Hyperledger Fabric and Composer)

free or priced with support available

- ✓ Developer's Sandbox using Scripts to deploy on Bluemix Containers with Kubernetes
- ✓ Download and run on-prem IBM z, LinuxONE, Power, x86

Govern

Maintainers/Initiators

- ✓ Create and Join network flows
- ✓ Administer network permissions
- ✓ Set Business level policy

Priced plans in the IBM Cloud

Runs on LinuxONE

Entry (hourly)

- ✓ Network runs in a shared cluster
- ✓ Affordable for small Dev/Test

Coming Soon

Enterprise (monthly)

- ✓ Network runs in shared cluster
- ✓ Comfortable with Cloud

Generally Available

Enterprise+ (monthly)

- ✓ Network runs in dedicated cluster
- ✓ Regulated Industries

Coming Soon

Self-managed

- ✓ Peers on-prem

Coming Soon

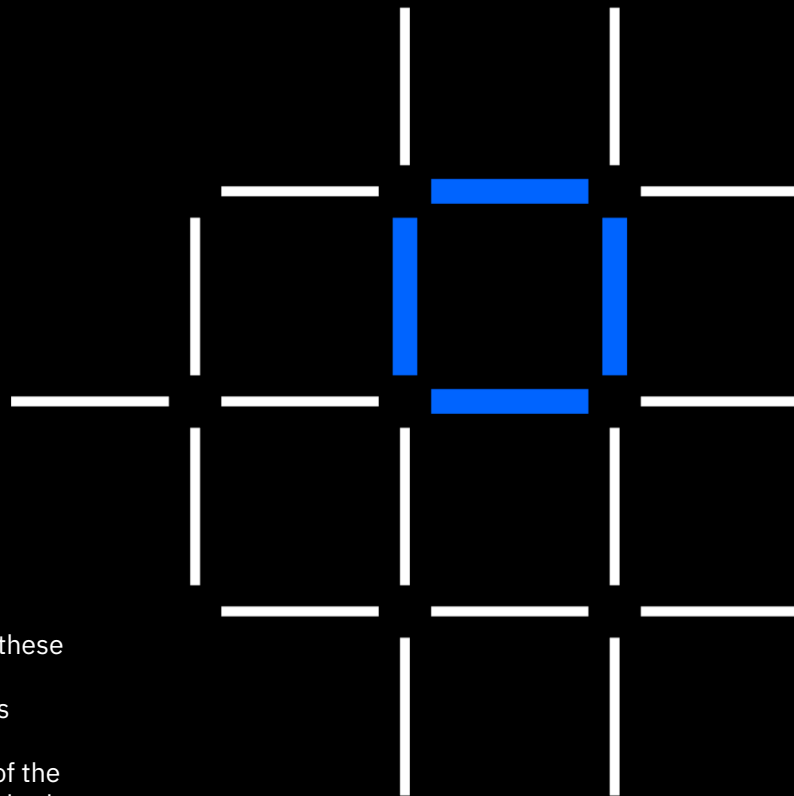
Operate

Maintainers/Initiators

- ✓ Run a distributed business network
- ✓ Highly secure, differentiated compute
- ✓ Monitor and manage

Thank You!

IBM Blockchain



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