

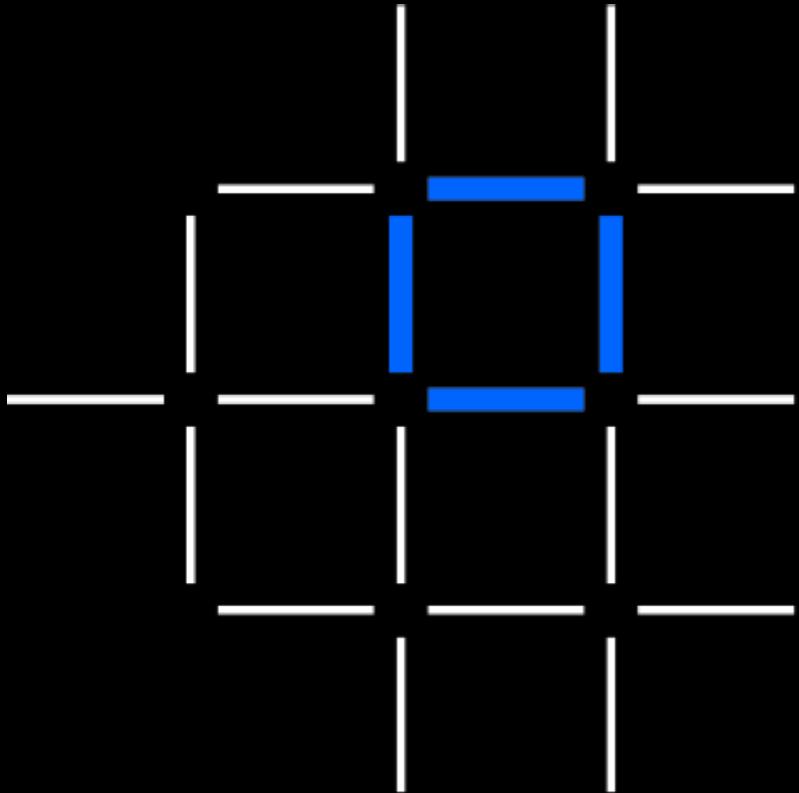
IBM Blockchain Platform

Austin Grice

austin.grice@ibm.com

Garrett Woodworth

garrett.lee.woodworth@ibm.com



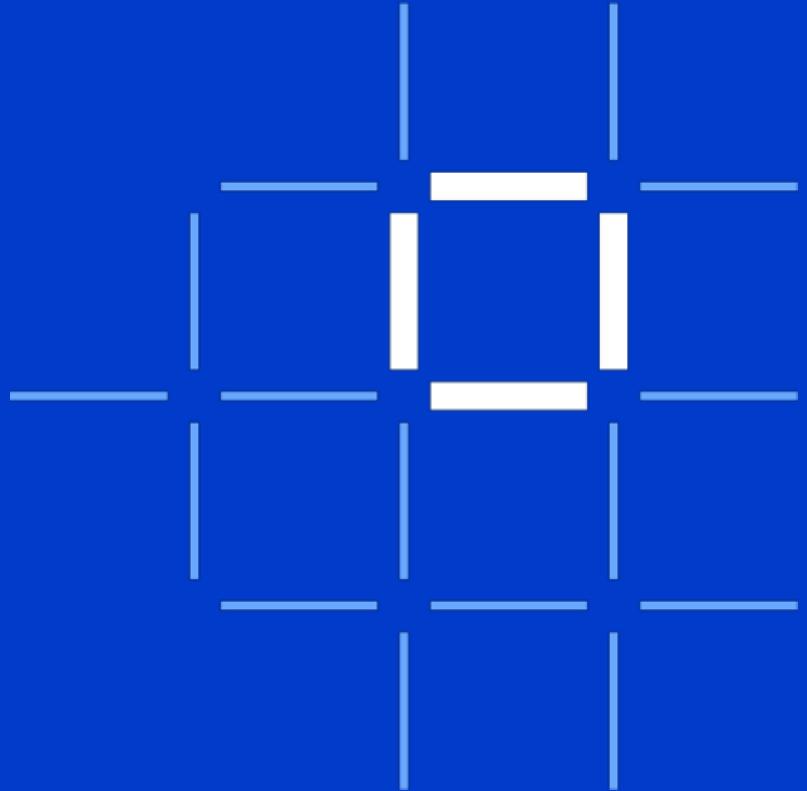
Blockchain Primer

IBM Blockchain Platform

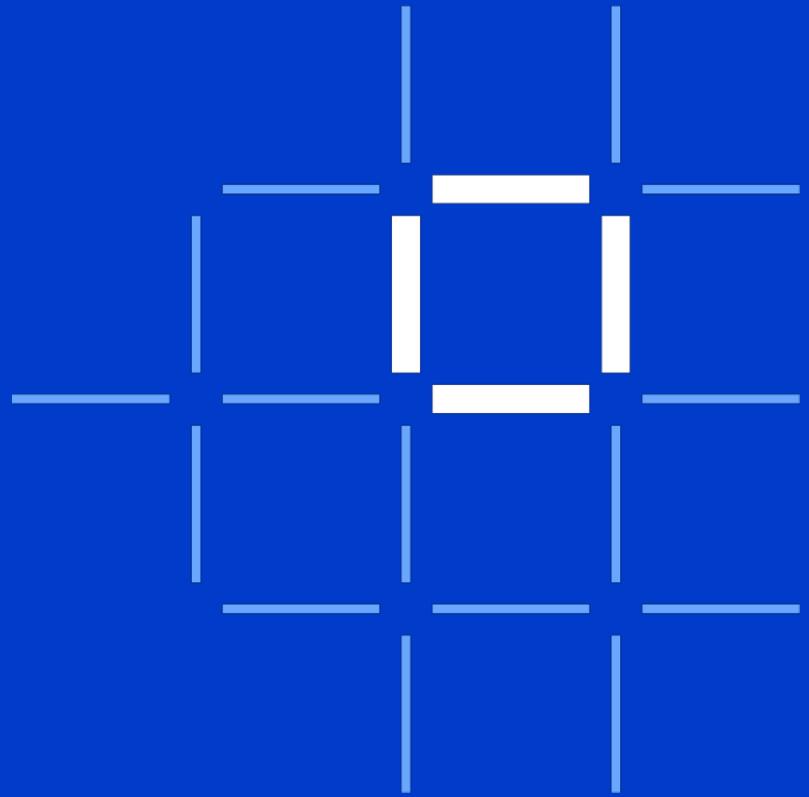
Demo

Offering Roadmap

Why IBM Z



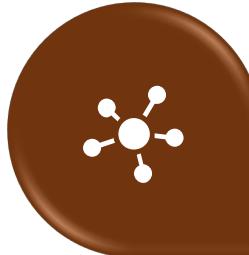
Blockchain Primer



What is blockchain for business based upon

Shared Ledger

Append-only,
distributed system of record,
shared across business
network



Smart Contract / chaincode

Business conditions
embedded in code &
executed as transactions

Privacy

Ensuring appropriate
visibility; transactions are
secure, authenticated &
verifiable



Consensus

Appropriate parties agree to
valid transactions

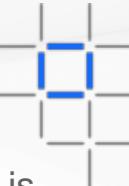


Broader participation, lower cost, increased efficiency

**Blockchain is usually not replacing systems of record (SoR),
databases or transactional systems, but complementing them.**



HYPERLEDGER FABRIC

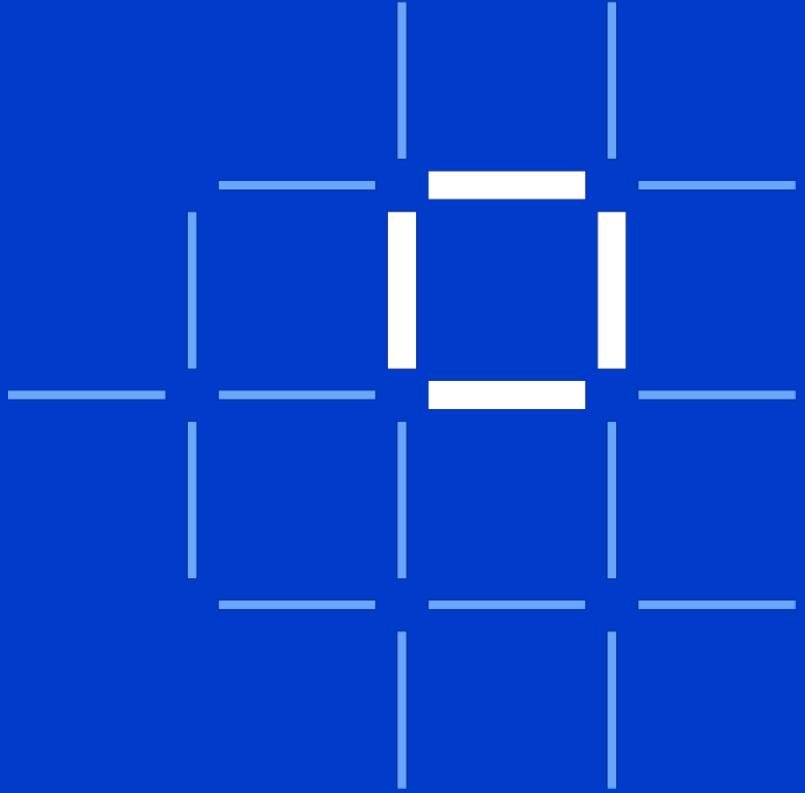


A screenshot of a web browser displaying the Hyperledger Fabric project page. The URL is https://www.hyperledger.org/projects/fabric. The page features the Hyperledger logo and the text "THE LINUX FOUNDATION PROJECTS". Below this, the "HYPERLEDGER" logo is displayed. The main content area has a dark blue background with a network of glowing blue dots and lines representing a blockchain. The text "HYPERLEDGER FABRIC" is prominently displayed. Two buttons are visible: "GET THE CODE" and "BUILD YOUR FIRST NETWORK". At the bottom left, it says "Type: DLT, Smart Contract Engine" and "Status: Active". A note states "Hyperledger Fabric is a blockchain framework implementation and one of the most active projects in the Hyperledger family." To the right, there is a small video player with the text "Hyperledger Fabric Explainer".

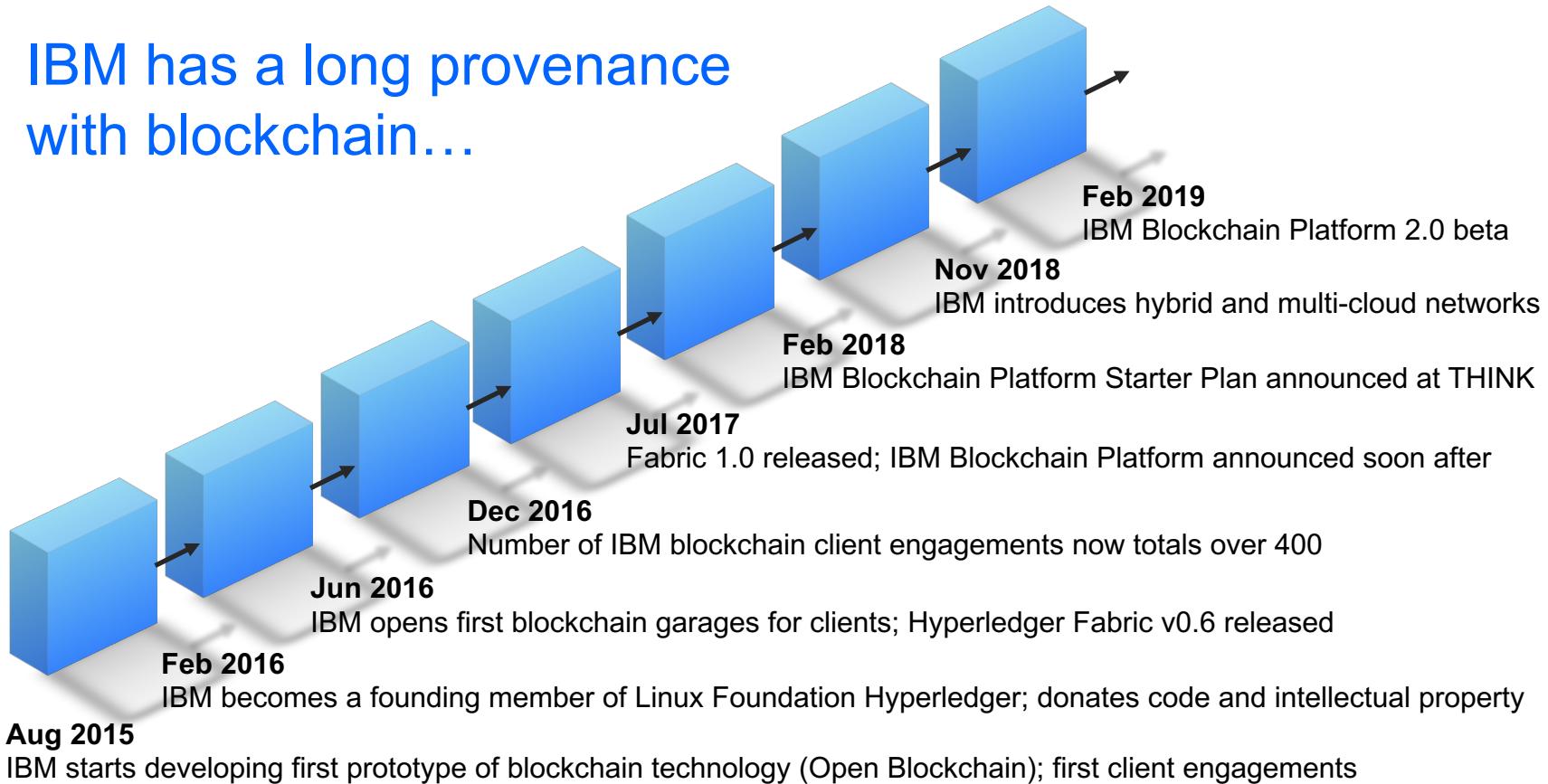
- An implementation of blockchain technology that is a foundation for developing blockchain applications
- Emphasis on ledger, smart contracts, consensus, confidentiality, resiliency and scalability.
- V1.4 released January 2019
 - Long Term Service release with emphasis on production operational and serviceability enhancements
 - New programming model abstractions for ease of development
- V2.0-alpha released April 2019
- IBM is one of the many contributing organizations

IBM

IBM Blockchain Platform



IBM has a long provenance with blockchain...



Customers want choice and control to scale blockchain

It's a Multi-Cloud World

The multi-cloud era has arrived. Today, 8 out of 10 businesses rely on multiple clouds to meet their IT needs, with 71 percent using more than three

Data Control

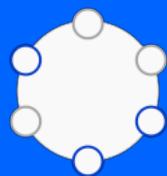
Increasing regulations (e.g. GDPR) and privacy concerns impact how and where data is stored within a blockchain network

Blockchain = Distributed Ledger

Growing networks need to have the ability to address the data hosting requirements of their members in order to recruit and scale

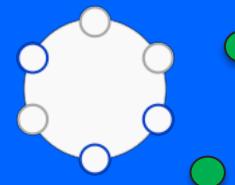
Blockchain ‘Network’ formation patterns emerging

‘Contained’ networks



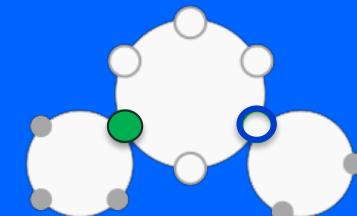
Deployed fully managed networks, often POC/Pilot

‘Distributed’ networks



Distributed peers – store ledger data wherever you want

‘Connected’ networks



Unleashed power of the peer
- connect to multiple networks / Ordering Services

Technology & roadmap progression

The evolution of the IBM Blockchain Platform

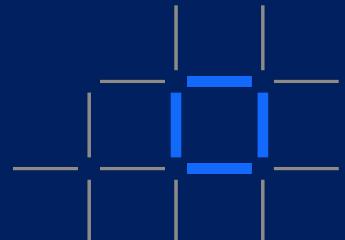
IBM Blockchain Platform v1

- Starter Plan (SaaS)
- Enterprise Plan (SaaS)
- Enterprise Plus (SaaS)



IBM Blockchain Platform v2

- IBM Blockchain Platform for Multi-cloud
- IBM Blockchain Platform for IBM Cloud Private
- IBM Blockchain Platform for AWS
- IBM Blockchain Platform 2.0 Beta (SaaS)



Why IBM Blockchain Platform 2.0?

IBP Anywhere! *The ultimate in choice & control for your blockchain network*

Build your network faster and easier within a seamless experience

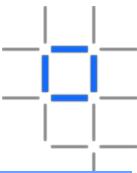
- Smooth integration between smart contract development (VS Code) and network management
- Simplified DevOps allows you easily move from development to test to production from a single console
- Support for writing smart contracts in Javascript, Java, and Go languages

Operate and govern networks with total control

- Deploy only the blockchain components you need (Peer, Ordering Service, Certificate Authority)
- Redesigned console lets you manage network components in one place, no matter where they are deployed
- Maintain complete control of your identities, ledger, and smart contracts

Grow distributed networks with ease with newly enabled multi-cloud flexibility

- Connect to nodes running in any environment (on-premises, public, hybrid clouds)
- Easily connect a single peer to multiple industry networks
- Start small, pay as you grow for what you use with no upfront investment and upgrade easily through Kubernetes



What's new?

More visual, more choice, & more flexibility with better tools and scalable pricing

Flexibility to do what you want, where you want

- Access UI via IBM Cloud or on-premises (ICP)
- Self- Managed: Private Cloud for on-premises and public cloud deployments of Hyperledger Fabric networks
- Hybrid Deployment: Deploy individual components within your own Private Cloud or AWS and have the network hosted in IBM Cloud
- IBM – Managed: IBM hosts for you through IBM Cloud services
- Your network component visualized

Performance and expertise to help you scale

- Non-disruptive Fabric upgrades
- 99.995% availability, designed for production
- Disaster Recovery
- Single and multi-zone HA
- IBM created and open-sourced Hyperledger Fabric
- The only formal commercial support offering for Hyperledger Fabric
- Hundreds of networks

Tools to help you get started and manage

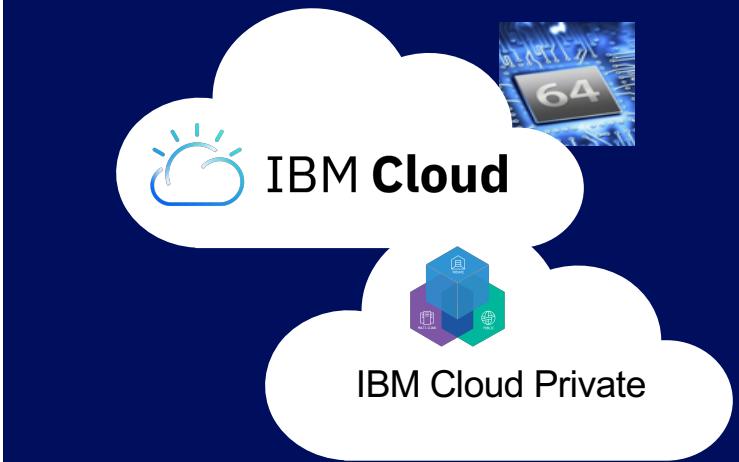
- Simple SDK for smart contract and application development
- IBM Blockchain Platform IDE
- Management of Peers (Cloud, on-premises, multi-cloud), Ordering Service (Solo, Kafka, Raft), CA, Channels, Identity
- Node-level logs
- API access to UI capabilities
- Quick start template and samples for development
- Management & Governance tooling

IBM Blockchain Platform 2.0 (beta)

- Infrastructure is provisioned separately using Kubernetes
 - Scaling and flexibility
 - More availability zones and disaster recovery when using the IBM Kubernetes Service
 - Hybrid networks (post beta) using IBM Cloud Private (on-premises and other cloud providers)
 - New administration and governance UI
- New pricing structure (TBA)
- New IBM Blockchain Developer VSCode IDE
- Enterprise Grade:
 - Easy migration of networks from test to prod
 - Non-disruptive upgrades
 - 99.995% availability

The next generation

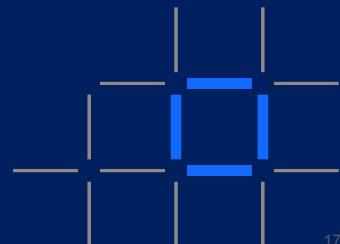
Provision the next generation of hybrid blockchain networks



The easiest way to get started

IBM Blockchain Platform 2.0 capabilities checklist

- ✓ Easily create smart contracts and client applications using VSCode
- ✓ Console UI to create, manage and grow hybrid multi-cloud networks
- ✓ Customer is custodian of all private keys and certificates
- ✓ Support for rolling migrations
- ✓ Support for single and multi-zone HA
- ✓ 99.995% availability
- ✓ Integration with IBM Logging Service
- ✓ Integration with IBM Operational Metrics Service
- ✓ Governance using IBM Blockchain Platform Console UI
- ✓ Easy migration and management across dev, test and prod environments
- ✓ Support for advanced features such as: Service Discovery, Gossip and Private Data Collections
- ✓ Beta based on Fabric 1.4 LTS



IBM Blockchain Platform for IBM Cloud Private

- Deploy a distributed peer or the entire network to an environment of your choice
 - Supports **data residency, regulation and compliance** requirements
 - Currently includes single instances of orderers
- IBM Blockchain Platform distributed peers on IBM Cloud Private (ICP) leverage the ordering service and certificate authorities running on IBM Cloud
- Pricing is Virtual Processor Core (VPC) based
- Free-of-charge Community Edition version available for evaluation, includes forum based support.
- ICP info:
 - http://www-01.ibm.com/common/ssi>ShowDoc.wss?docURL=/common/ssi/rep_ca/1/897/ENUS218-441/index.html&request_locale=en
 - https://console.bluemix.net/docs/services/blockchain/howto/remote_peer.html

Self Managed

Private Cloud for on-premises and public cloud deployments of Hyperledger Fabric networks



Enables you to run Hyperledger Fabric components: the **Ordering Service, Certificate Authority and Peer on Kubernetes** through the deployment of Helm Charts for these components.

IBM Blockchain Platform for AWS

- Deploy a distributed peer in 10-15 minutes using AWS quick start templates
 - Supports **data residency, regulation and compliance** requirements
- Distributed peers on AWS leverage the ordering service and certificate authorities running on IBM Cloud
- Offered as a free-of-charge non-production Community Edition. User pays only for the AWS resources utilized by the distributed peer and IBM Blockchain Platform (IBP) membership.
- Support provided by the IBP resource and support forums
- Available now!

<https://aws.amazon.com/quickstart/architecture/ibm-blockchain-platform/>

Hybrid Deployment

Deploy individual components (peers) locally within your own Private Cloud or directly through AWS and have the broader network hosted in IBM Cloud



Running a peer in a non-IBM Cloud environment that can connect back to an IBP network

Evolving our platform to provide all the flexibility needed to build, deploy, govern and grow networks

IBM Blockchain



IBM Blockchain Platform

One Platform Experience

Cost varies

In an effort to simplify our offerings, all IBM Blockchain Platform plans will be consolidated into a single IBM Blockchain Platform offering, which customers can deploy on an environment of their choice as well as customize key features.

- IBM Blockchain Platform
- Ordering Service
- Certificate Authority
- Peer
- IBM Cloud Deployment
- Choice of Deployment



SaaS

Full Network

Deployed on IBM Cloud



For customers without specific deployment requirements, our IBM Blockchain Platform offering is deployed on the IBM Cloud.

Use: Dev/Test and Production
Infrastructure: Pre-defined by IBM Cloud
Configuration: Default with optionality
Software lifecycle: IBM

Software - Multi Cloud

Distributed Peer

Peers Deployed on customer's choice of environment



For customers who require greater deployment flexibility. They can deploy peers on an environment of their choice, while deploying other components on the IBM Cloud.

Use: Dev/test and production
Infrastructure: on-premises, AWS
IPB Infrastructure: IBM Cloud with custom options
Configuration: Default with optionality
Software lifecycle: IBM manages IPB & associated components, customer manages the Peer

Full Network

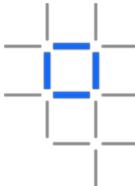
IPB & Components Deployed on customer's choice of environment



For customers who require the solution to run entirely on their infrastructure. They can license the full IBM Blockchain Platform with each of the components.

Use: Dev/test and production
Infrastructure: customer-owned & managed
Configuration: customer-managed
Software lifecycle: customer-managed (compatibility guidelines apply)

One product... Multiple Deployment Patterns



	SaaS + Distributed Peer	Full Fabric Network on ICP
Scope	Running a peer in a non-IBM Cloud environment that can connect back to an IBP network	Enables you to run Hyperledger Fabric components: the Ordering Service, Certificate Authority and Peer on Kubernetes through the deployment of Helm Charts for these components. <i>This is not a 'production' suitable environment yet as it only has SOLO - updates will be included with UI release</i>
Component	Peer	Peer Ordering Service (Solo) CA (Single)
Infrastructure	IBM Cloud Private (Linux 64-bit & IBM Z/LinuxONE), AWS	

IBP for ICP is best suited for those who:

1. Won't consider IBM Blockchain Platform without having some **on-premises** option available
2. Have **data residency restrictions** (data cannot leave the country)
3. Have the requirement to **keep all of their data on-premises** (behind their firewall – some government entities, healthcare)
4. Have an **affinity to a particular cloud** provider (due to audit mechanisms, compliance, preference)

However, If you are:

- Exploring blockchain technology for your business
 - A developer looking to learn how to develop smart contracts, and govern networks
- > IBM Blockchain Platform Starter plan is our recommended product. An easy-to-use UI to reduce network administration and governance time for pilot evaluation or pre-production POCs.

Scenarios when to choose IBP for ICP

	Need	IBP for ICP
Functional Requirement	Need a single contained solution/environment Need easy to use UI tooling Need the ability to easily scale my resources up and down	IBP and ICP are both needed ✓ (Q1) ✓
Non-Functional Requirement	All data must be on-premises (data privacy specific) Data residency Restrictions (country specific)	✓ ✓
Preference	Non-IBM Cloud Infrastructure affinity (i.e. AWS) Depreciate existing infrastructure investment	Once ICP Cloud Automation Manager is validated ✓

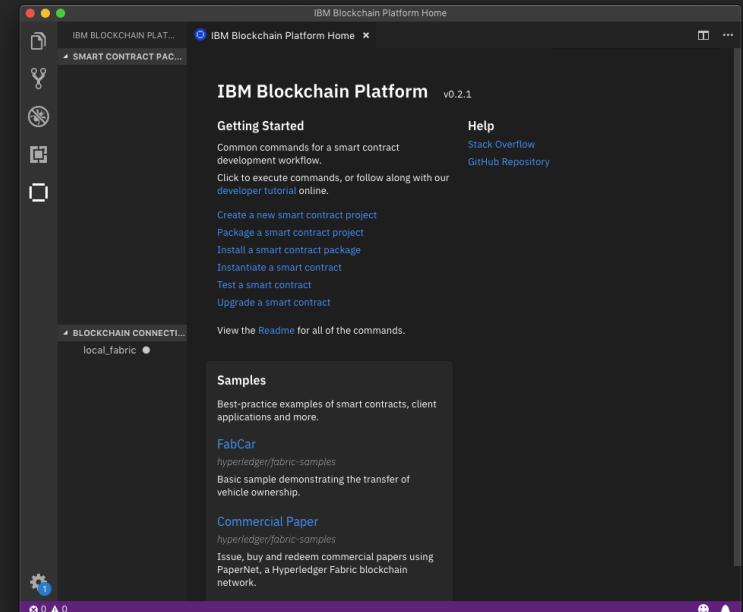
Legend	Does not address	Depends/Future	Enabled
--------	------------------	----------------	---------

IBM Blockchain Platform VSCode Extension

- Free IBM Blockchain Platform Open-Sourced Extension built on Hyperledger Fabric
- Consumed through VSCode, an industry-leading source code editor
- What can a developer do with it?
 - Generate a skeleton smart contract
 - Develop smart contracts
 - Package up a smart contract
 - Connect to any Fabric runtime
 - Install and Instantiate smart contract packages
 - Test and debug smart contracts
 - Pull down and modify Fabric samples from Github
- Available from:
 - <https://marketplace.visualstudio.com/items?itemName=IBMBLOCKCHAIN.ibm-blockchain-platform>

Develop

Provision the next generation developer tools



The easiest way to build

Welcome to the new IBM Blockchain Platform Developer Experience!

The latest versions of the IBM Blockchain Platform and Hyperledger Fabric hail a new era of capabilities that bring simplicity, speed, and value to the blockchain developer community.



Hyperledger Fabric Features and Updates

Now Available in Fabric 1.4:

A simple SDK for smart contract and application development

- [FAB-11246](#) allows developers to focus on the smart contract logic that describes their business transactions.
- [FABN-692](#) delivers a new high-level API that cuts the amount of application code required to invoke a smart contract by 90%.
- [FAB-12071](#) enables developers to seamlessly discover and exploit ever-changing networks without application change, making them more responsive and easier to scale.



IBM Blockchain Platform Developer Tools

Now Available:

IBM Blockchain Platform IDE

- The IBM Blockchain Platform VSCode Extension enables you to discover, code, test, debug, package, deploy, and publish smart contracts and applications using a single tool.



Hyperledger Fabric and IBM Blockchain Platform Samples & Tutorials

Now Available:

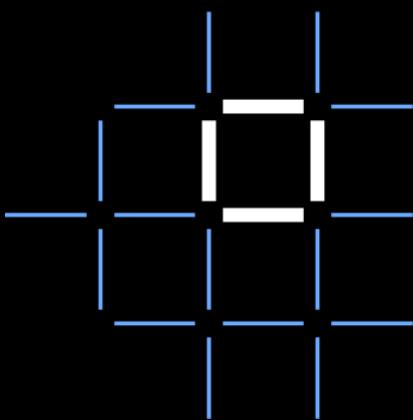
Hyperledger Fabric Samples

- Fabcar
- Commercial Paper

IBM Blockchain Platform Tutorials and Patterns

- Commercial paper with the IBM Blockchain VSCode extension
- Smart contract with the IBM Blockchain Platform VSCode extension
- Global finance blockchain application VS Code extension

You can now run
IBM Blockchain
Platform ***Anywhere***



Self—Managed

Private Cloud for on-premises
and public cloud deployments
of Hyperledger Fabric networks



Enables you to run Hyperledger Fabric components:
the Ordering Service, Certificate Authority and
Peer on Kubernetes through the deployment of
Helm Charts for these components.

Hybrid Deployment

Deploy individual components
(peers) locally within your own
Private Cloud or directly
through AWS and have the
broader network hosted in IBM
Cloud



Running a peer in a non-IBM Cloud environment
that can connect back to an IBP network

IBM Managed

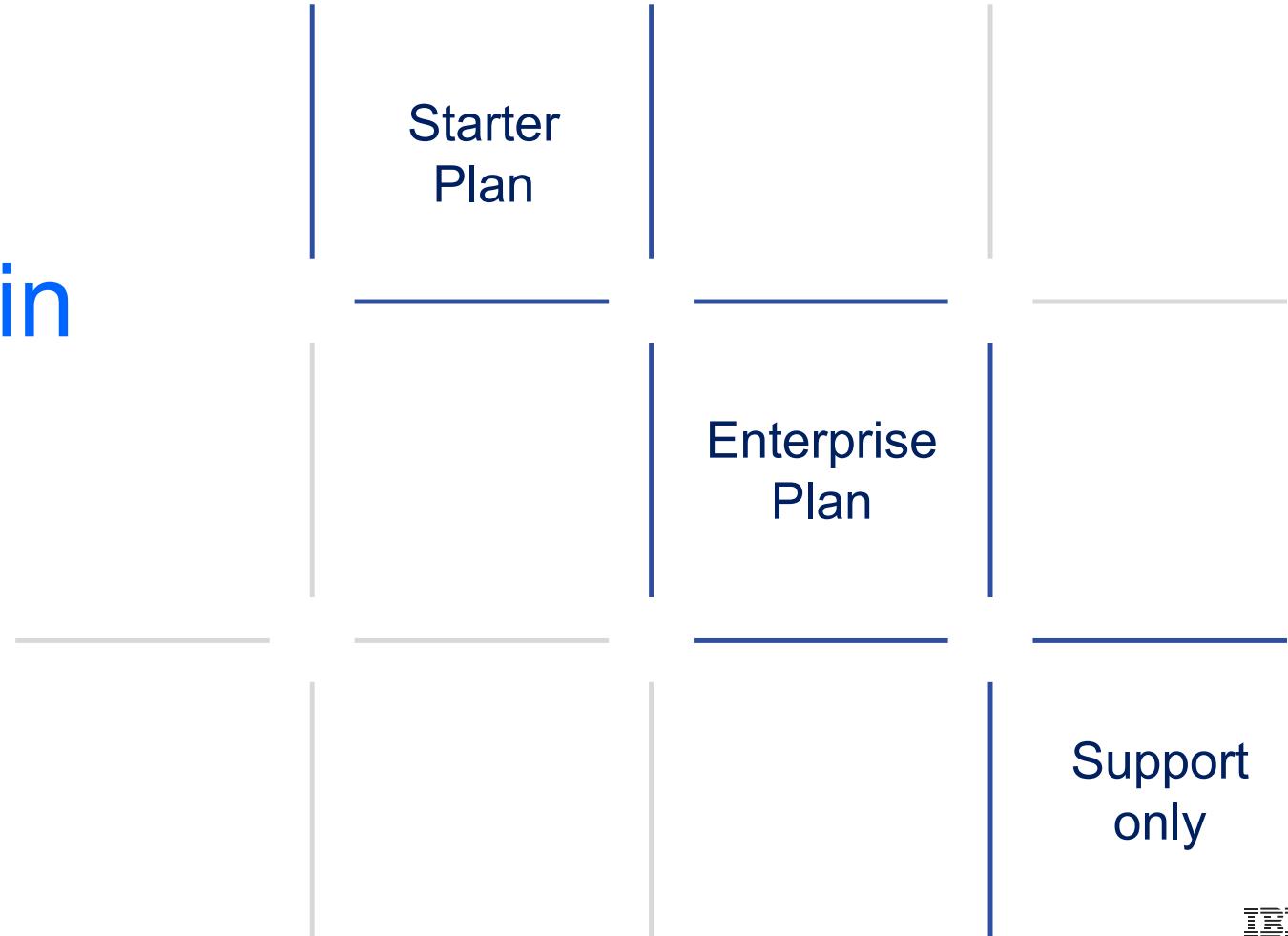
IBM hosts it for you through its
IBM Cloud services



IBM Blockchain
Platform 2.0 (SaaS)

SaaS offering that is the easiest way to get started
with Blockchain

Existing IBM Blockchain Platform offerings



IBM Blockchain Platform Starter Plan

- Get started with IBM Blockchain Platform with **one-click setup and a fully functional network**
 - One-click network configuration, code samples and support for Hyperledger Fabric 1.2.1
 - Environment enables iterative development prior to production deployment
 - Same experience as Enterprise
 - Uses SOLO ordering for simplified configuration, development and testing
- **Monthly charge of \$500** for two peers
 - \$250 membership fee per month, plus \$125 per peer
- Sign up at: www.ibm.com/blockchain

IBM Managed

IBM hosts it for you through its IBM Cloud services



SaaS offering that is the easiest way to get started with Blockchain

IBM Blockchain Platform Enterprise Plan

- Everything in Starter, plus everything you need for a **full production** environment:
 - Fault-tolerant ordering service, added layers of security and premium support
 - Compliance certification: ISO27001, GDPR (coming soon), SOC 2 Type 2 (coming soon)
 - Single-zone HA/DR
- Monthly cost starts at **US\$3000 per organization per network**
 - Assumes two peers for high availability (\$1000 per peer plus \$1000 membership fee)
 - Includes basic blockchain support only; support for services on IBM Cloud is an additional 10%
 - Certificate authorities and access to the ordering service is not chargeable

IBM Managed

IBM hosts it for you through its IBM Cloud services



SaaS offering that is the easiest way to get started with Blockchain

IBM Blockchain Platform: IBM Provisioned Offerings

IBM Blockchain

Hyperledger Fabric Only



Docker Images

No cost

Support for cost

For clients who do not wish to purchase the IBM Blockchain Platform, we offer IBM signed and certified Docker images allowing clients to build directly on top of Hyperledger Fabric.

IBM Blockchain Platform*



Starter

\$250 / month Network Fee – D1XFHLL

Plus \$125 / month per peer deployed – D1XFILL

Get started in development and pre-production with a one-click setup of the IBM Blockchain Platform. Includes a fully functional kick starter network, sample applications and informational tutorials.



Enterprise

\$1000 / month Network Fee – D1V2RLL

Plus \$1000 / month per peer deployed – D1V2SLL

Get all the features of starter plan, plus everything you need for a full production environment; including HSM availability, fault tolerant ordering service, added layers of security and premium support.



Enterprise Plus**

Custom Pricing

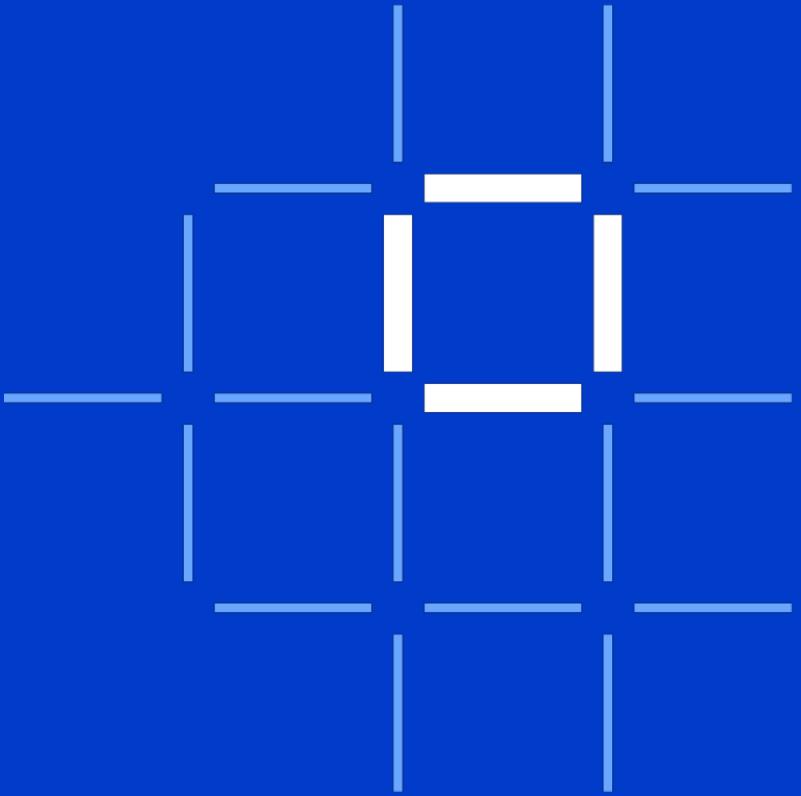
Limited Availability

Get all the features of Enterprise plan, plus the highest performance, isolation and scalability for the most demanding production workloads in regulated industries.

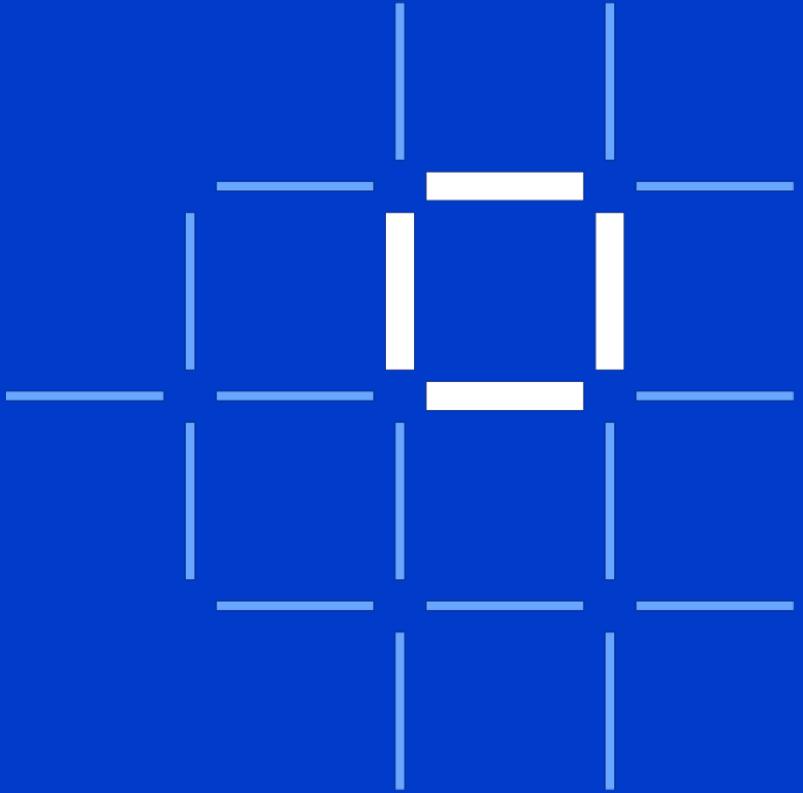
*with some exceptions, IBM Blockchain Platform can only be deployed on the IBM Cloud

**Enterprise Plus plan is being merged with Enterprise Plan

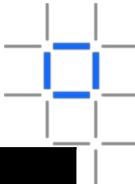
Demo



Offering Roadmap

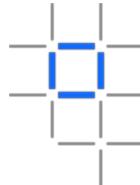


Offering components



	GA IBP for ICP setup	Closed Beta Operational & Governance Tools	Open Beta Developer Tools
Description	Set up Fabric components as Helm Charts	<p>Operational tools that make network management easier; connecting, deploying and managing blockchain peers</p> <p>Governance tools that simplify the management of the business network, including: Activating, customizing and changing networks (inviting new members/participants etc), implementation of policies that control how channels (subset of networks) get updated and simplifying the implementation of rules that authorize network updates</p>	<p>Enables you to quickly build your blockchain application including tutorials, a simplified programming model, and an extension to:</p> <ol style="list-style-type: none">1) Write, test, and debug your smart contract2) Test sample applications3) Seamlessly deploy smart contracts into a production-ready blockchain environment
Offering	IBP for ICP	UI for IBP for ICP	IBP VS Code Extension
Available in first release	Yes	No	No
Screens	<ul style="list-style-type: none">• ICP Catalog UI• IBP Helm Chart UI• ICP additional capabilities; monitoring, logging	<ul style="list-style-type: none">• Capabilities• Flows of key features (i.e. add peer to channel)	<ul style="list-style-type: none">• Azure discovery• Install steps• Editor/Explorer

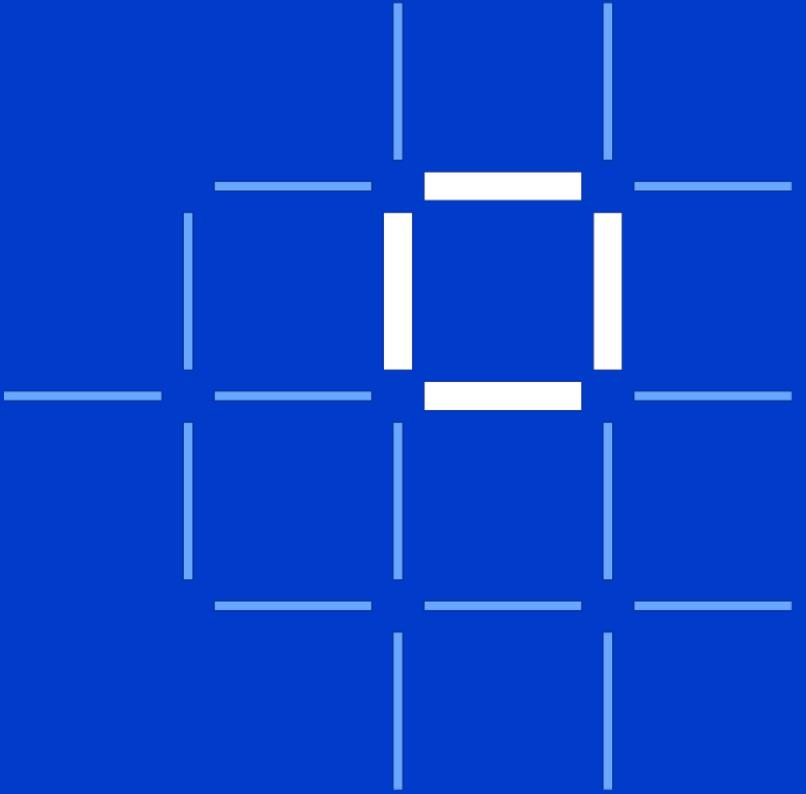
IBM Blockchain Platform “anywhere” roadmap



IBM Blockchain Platform for	Offering Roadmap				
	Distributed Peer	Full Pilot/Dev Fabric Network	Full Production Fabric Network & UI <i>[CFT OS support]</i>	Deployment to SSC4ICP (Secure Service Container)	HSM Integration
IBM Cloud Private*	Q4	Q4	Q1/Q2 2019	Q1 2019	1H 2019
Mainframe/Z Unique Features					

*IBM Cloud Private is an application platform for developing, scaling and managing on-premises, containerized applications. It includes the container orchestrator Kubernetes, a private image repository, a management console, and monitoring frameworks.

Why IBM Z



IBM Blockchain Platform on LinuxONE

Same experience to the power of LinuxONE

Integration

Seamless and low latency connections between legacy applications

Scalability

Scale peers horizontally, multiple secure peers hosted on the same infrastructure

Coming Soon:

User Interface similar to IBP2.0

One User Interface - multiple platforms

Modern Development

Hyperledger Fabric on Kubernetes that can be deployed through IBM Cloud Private

Helm charts to ease deployments

Tooling

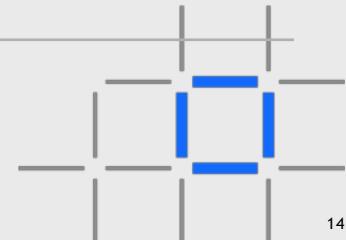
Operational tools that enable administrators to manage, monitor and govern their nodes across any deployment.

IBM Cloud Private

Out-of-the box IBM Cloud Private capabilities including management console, logging and monitoring frameworks.

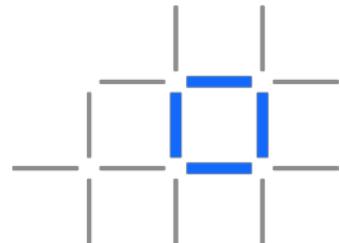
IBM Blockchain Platform benefits from Z Security

Workload Isolation	 Enables isolation of network components on one system from each other and from other processes
Integrated Crypto Hardware	 Every transaction requires signatures and verification which involves crypto (make sure this is done right)
Key Encryption & Management	 Protect your keys -> your keys are your identity (estimated 1.1 \$billion worth of cryptocurrency stolen in 1 st half of 2018)
Data Encryption	 Blockchain has potentially sensitive data -> protect with encryption
Network Encryption	 Protect data transmitted between application, blockchain components, and integrated systems
Time Source Security	 Blockchain timestamps crucial to keeping accurate ledger



Why is encryption so important in Blockchain?

IBM Blockchain



Keeper of the keys!

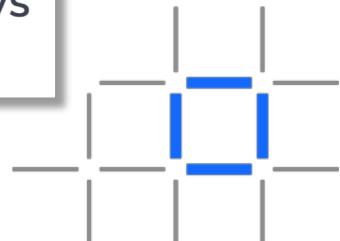


TECH • BITCOIN

Bitcoin Worth \$72M Was Stolen in Bitfinex Exchange Hack in Hong Kong

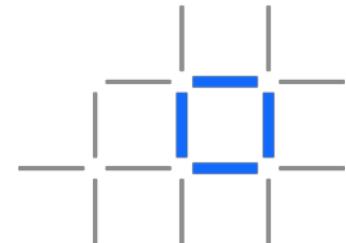
MAN WHO 'THREW AWAY' BITCOIN HAUL NOW WORTH OVER \$80M WANTS TO DIG UP LANDFILL SITE

CEO of Canadian Exchange QuadrigacX Dies With Private Keys to Cold Wallet



You're not using bitcoin - Why should you care about key safety with blockchain for business?

TRUST
Hard to build, easy to lose

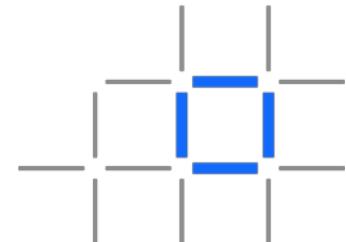


How we protect our keys – Why FIPS matters?

IBM Blockchain



- **Why risk the protection of the most important part of a blockchain?**
- **How do you access your keys to do transactions?**
- **Keys never in the clear**
- **Domains – more master keys per card**
- **TRNG**

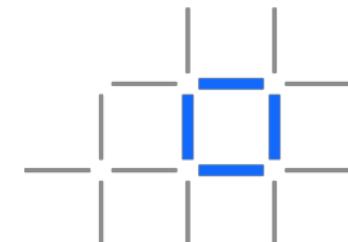


FIPS 140-2 Level 4 - What is the difference?

IBM Blockchain



Security requirements	FIPS 140-2	Security level 1	Security level 2	Security level 3	Security level 4
Environmental Failure Protection Protection against attacks using extreme voltage or temperature.					✓
Tamper resistance Incl. active and immediate zeroization of plain text secret keys in case of attacks.					✓
Identity-based authentication The operator be individually identified.				✓	✓
Enhanced protection of secret and private keys Key entry and output only encrypted or in split-knowledge procedure.				✓	✓
Tamper detection and response Attempts at removal or penetration of the strong enclosure will have a high probability of causing serious damage to the module, i.e., the module will not function.				✓	✓
Tamper evidence An attack leaves visible traces. The attack may have been successful.		✓	✓	✓	✓
At least one cryptographic algorithm or security function implemented	✓	✓	✓	✓	✓



IBM Blockchain Platform benefits from Co-location on IBM Z with core transaction systems

Integration with transaction systems



Integrate Blockchain apps with legacy systems that contain connected information such as PII

Performant communication



Important for blockchain to reduce latency between network components to increase tx/s and to reduce wait time when connecting to legacy systems for information

Scalability 'Data center-in-a-box'

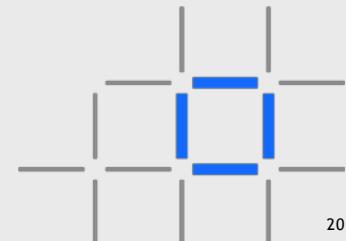


Grow your blockchain network to suit your needs (CPU, Memory, Network)

Operational efficiency

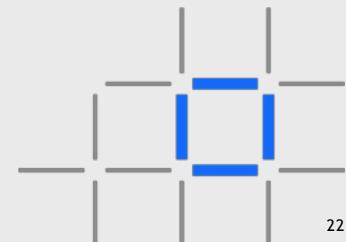


Manage your system efficiently and securely



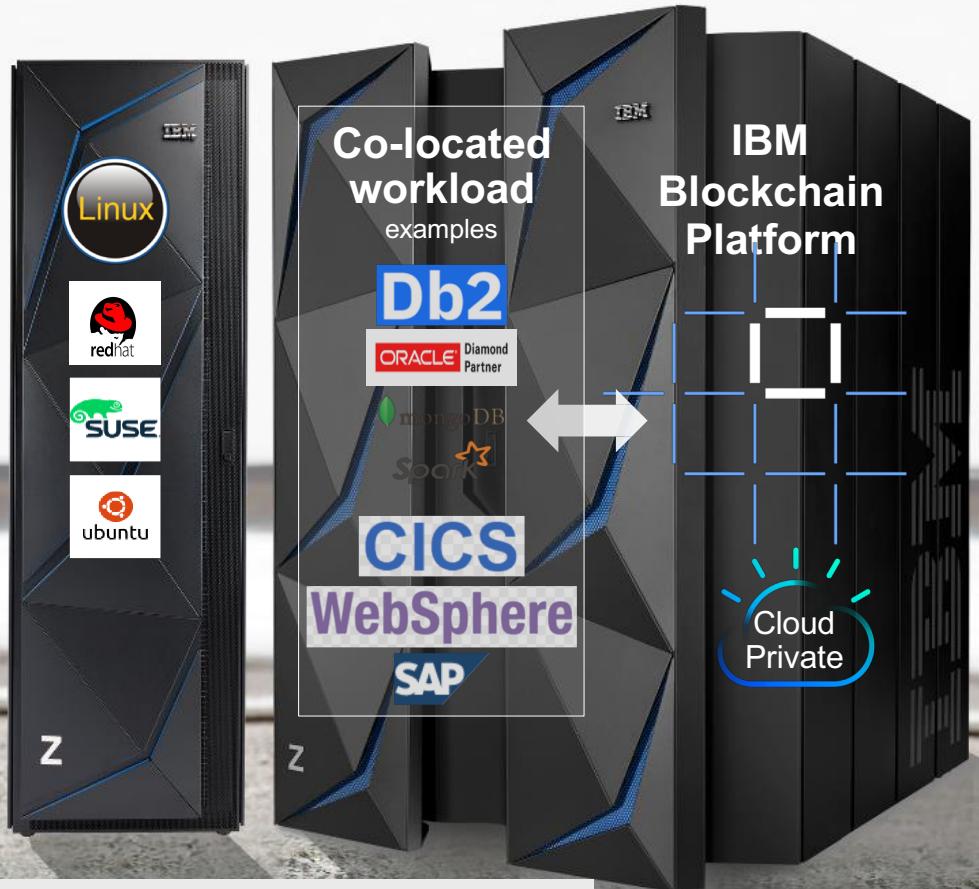
IBM Blockchain Platform benefits from IBM Z RAS

Extensive self-checking and self-recovery capabilities	Keep your blockchain up and running
Concurrent replace, repair, and upgrade	Make upgrades as needed
Redundant array of independent memory (RAIM) technology	You use blockchain to come to a consensus on which data should be on the ledger, make sure all this work is preserved by protecting data in case of emergency
Near-continuous availability and disaster recovery solutions	Make your blockchain network available to all participants all the time



IBM Blockchain Platform on IBM Z

All together benefit from IBM Z



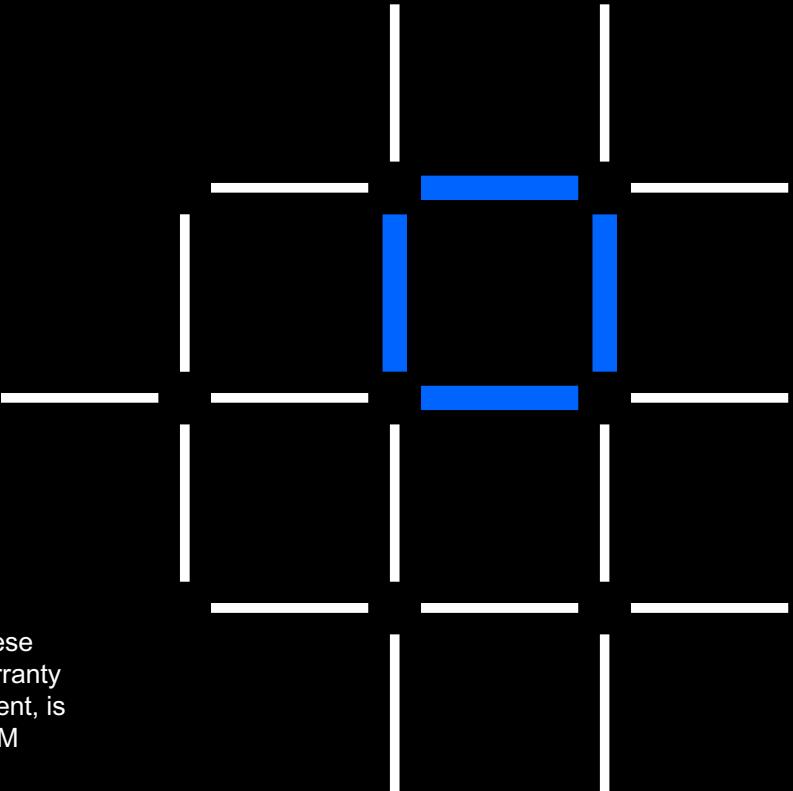
Thank you

IBM Blockchain

www.ibm.com/blockchain

developer.ibm.com/blockchain

www.hyperledger.org



© Copyright IBM Corporation 2017. All rights reserved. The information contained in these materials is provided for informational purposes only, and is provided AS IS without warranty of any kind, express or implied. Any statement of direction represents IBM's current intent, is subject to change or withdrawal, and represents only goals and objectives. IBM, the IBM logo, and other IBM products and services are trademarks of the International Business Machines Corporation, in the United States, other countries or both. Other company, product, or service names may be trademarks or service marks of others.



