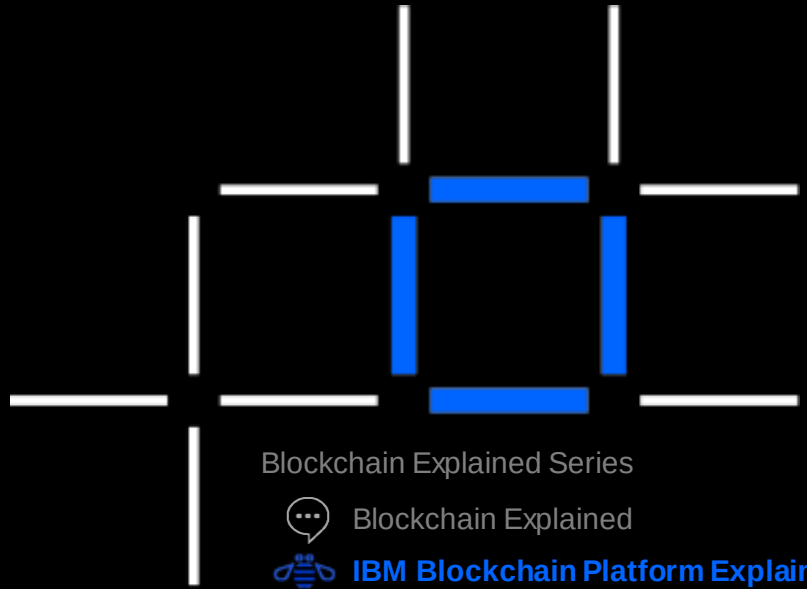
IBM Blockchain Platform Explained

An Introduction to the IBM Blockchain Platform

Guillaume Lasmayous – guillaume.Lasmayous@fr.ibm.com
IT Specialist, Blockchain Center of Competency
IBM Client Center Montpellier, France

Guillaume Hoareau – guillaume_hoareau@fr.ibm.com
IT Architect, Security
IBM Client Center Montpellier, France



Blockchain Explained Series

- Blockchain Explained
- **IBM Blockchain Platform Explained**
- Solutions Explained
- Garage Explained
- What's New
- Next Steps

V1.14, 15 November 2018

IBM **Blockchain**

IBM

IBM Blockchain Platform Overview

What you need to know

Roadmap

IBM's blockchain strategy and where the platform is going

Technical Details

The architecture behind IBM Blockchain Platform

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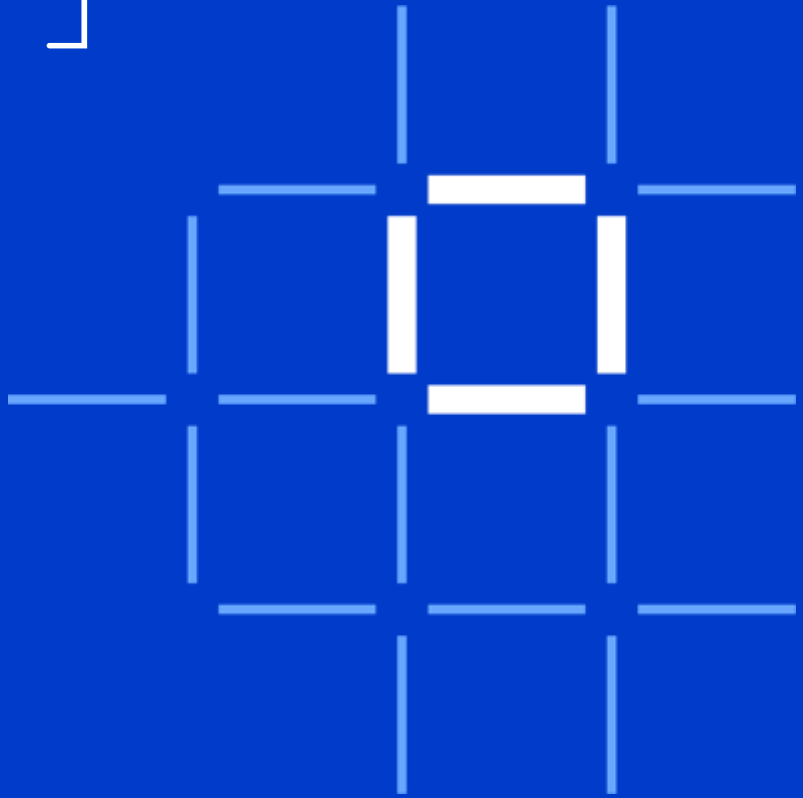
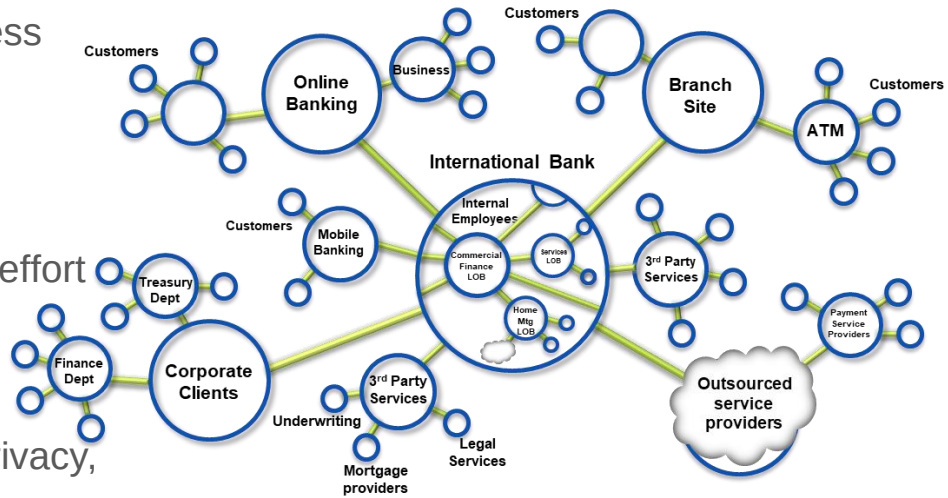


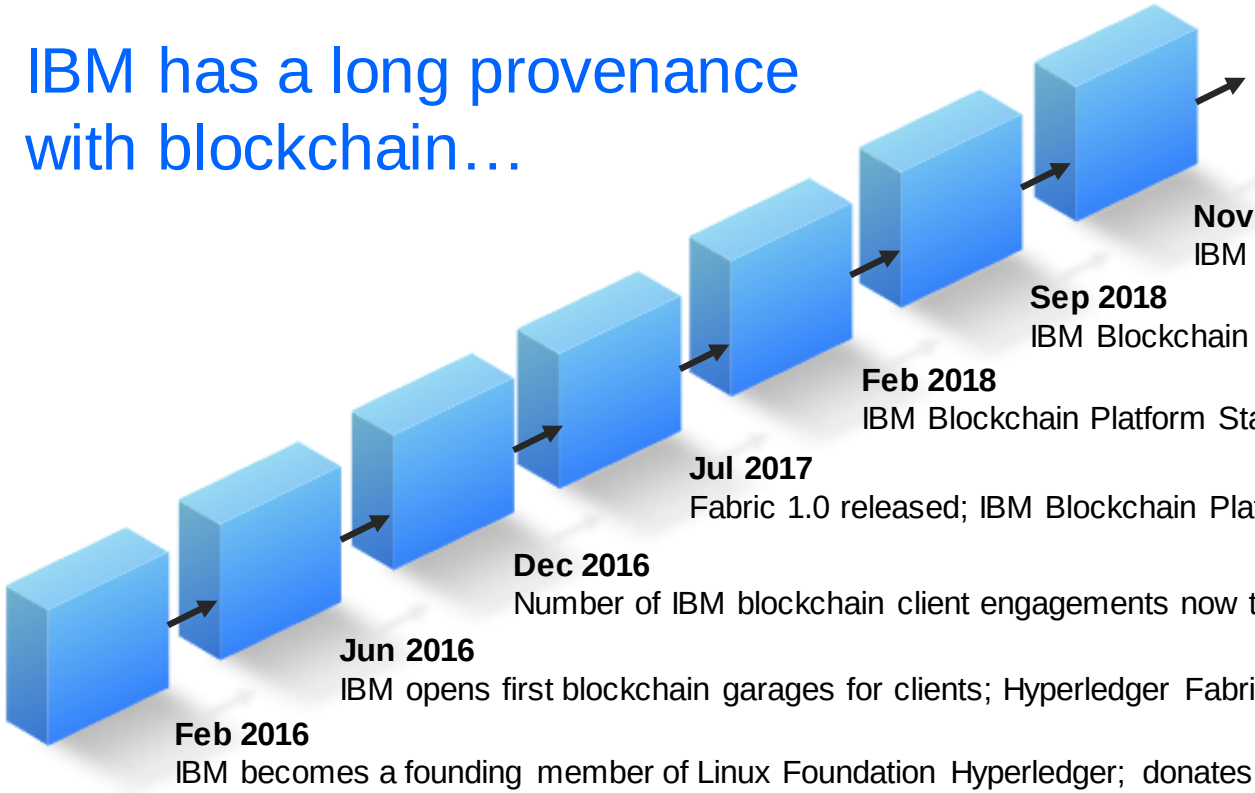
Blockchain Recap

- **Blockchain** is a shared, replicated ledger
  - Permissioned blockchains bring trust to business networks through consensus, provenance, immutability and finality

- **Linux Foundation Hyperledger** is a collaborative effort created to advance cross-industry blockchain technologies for business
  - Hyperledger **Fabric** is a blockchain providing implementation of a ledger, smart contracts, privacy, consensus and a client side SDK



IBM has a long provenance with blockchain…



Aug 2015
IBM starts developing first prototype of blockchain technology (Open Blockchain); first client engagements

Feb 2016
IBM becomes a founding member of Linux Foundation Hyperledger; donates code and intellectual property

Jun 2016
IBM opens first blockchain garages for clients; Hyperledger Fabric v0.6 released

Dec 2016
Number of IBM blockchain client engagements now totals over 400

Jul 2017
Fabric 1.0 released; IBM Blockchain Platform announced soon after

Feb 2018
IBM Blockchain Platform Starter Plan announced at THINK

Sep 2018
IBM Blockchain Platform Starter updated to Fabric 1.2

Nov 2018
IBM introduces hybrid and multi-cloud networks

IBM Blockchain Strategy

Drive the development of **applications** for specific business use-cases, to be deployed to active **hybrid multi-cloud blockchain networks**

Services

Collaborate with services teams from ideation all the way to production

Ecosystem

Tap into our diverse ecosystem to develop strategic partnerships and create your competitive advantage

Solutions

Solve critical industry challenges by building and joining new business networks and applications

Platform

Develop, govern and operate hybrid multi-cloud enterprise blockchain networks with speed and security

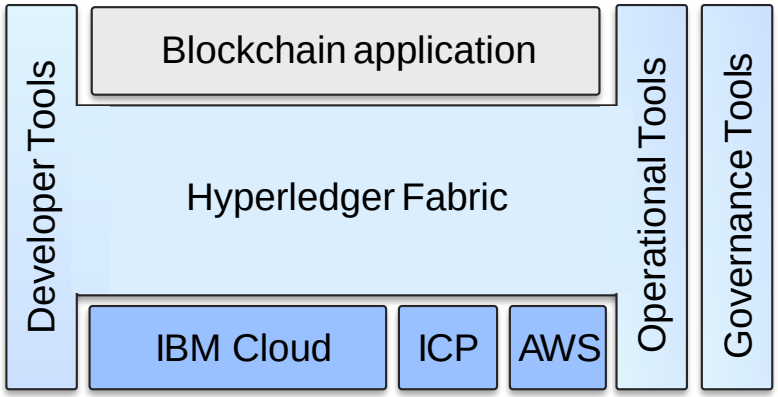
HYPERLEDGER

A founding, premier member of Hyperledger, IBM is committed to open source, standards & governance

Introducing the IBM Blockchain Platform

IBM Blockchain Platform is a fully integrated enterprise-ready blockchain platform designed to accelerate the development, governance, and operation of a multi-institution hybrid and multi-cloud business network

- **Developer tools** that enable you to quickly build your blockchain application
- Hyperledger Fabric provides the ledger, which is managed through a set of intuitive **operational tools**
- **Governance tools** for democratic management of the business network
- Flexible deployment options, including IBM Cloud Private (ICP), AWS and a highly secure and performant **IBM Cloud** environment



http://ibm.biz/Platform_Demo

End-to-end lifecycle coverage

Develop

- Accelerated creation of blockchain applications
- No-charge development and test tools hosted on IBM Cloud
- Based on popular Hyperledger Fabric

Govern

- Activate, customize and change complete blockchain business networks
- Secure democratic governance across organizations
- Implement rules for authorizing network updates

Operate

- Connect, deploy and manage blockchain peers with flexible deployment options
- Production ready, secure and scalable
- Based on Linux Foundation Hyperledger Fabric V1

Why IBM Blockchain Platform

Reduces risk

- Flexible pricing and support options for all sizes of deployments
- Democratic governance policies to help prevent unauthorized network changes

Saves time

- Implement blockchain projects more quickly
- Extensive toolset for development, governance and operation of blockchain networks

Enterprise ready

- Architected for High Availability and Disaster Recovery
- Highly secured and suitable for transactional workloads

Open

- Based on popular and open Linux Foundation Hyperledger technologies
- Avoid vendor lock-in! Embraces open source, open standards and open governance

Flexible deployment options

Plans	Key Features	Deployment
IBM Blockchain Platform Starter Plan	Easy on-ramp for blockchain-as-a-service	IBM Cloud
IBM Blockchain Platform Enterprise Plan	Production plan for industries comfortable with cloud	IBM Cloud
IBM Blockchain Platform for IBM Cloud Private	Deploy distributed peers(*) or entire network(^) on IBM Cloud Private	IBM Cloud Private
IBM Blockchain Platform for AWS	Deploy distributed peers on AWS(#)	AWS
Support-only	Supported instances of Hyperledger Fabric running outside IBM Cloud Platform	Docker

(*) Beta Sept 2018, GA 4Q18
(^) Development networks 4Q18, Production networks 1H19
(#) Non-production

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 of charge of $500** for two peers
  - $250 membership fee per month, plus $125 per peer
  - Receive $500 in IBM Cloud credits on sign-up

- 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 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
- 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
- Release schedule:
  - (*) Distributed peer beta in Sept 2018, GA 4Q18
  - (^) Full development network on ICP 4Q18
  - (^) Full production network on ICP 1H19
- 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

IBM Blockchain Platform Membership Plans	Starter	Enterprise	IBM Cloud Private	AWS
Suitability				
MVP	✓	✓	✓	✓
Pilot & PoC	✓	✓	✓	✓
Pre-production & Staging	✓	✓	✓	✓
Production		✓	✓	✓
Features				
Deploy and run chaincode	✓	✓	✓	✓
Hyperledger Fabric features and capabilities	✓	✓	✓	✓
Multiple org simulation	✓	✓	✓	n/a
Rolling migrations with no network outages	✓	✓	✓	✓
Low-code interface	✓	✓	✓	✓
Ability to scale	✓	✓	✓	✓
Support options	✓	✓	✓	✓
Fault tolerant ordering service		✓	✓	n/a
Cryptographic Acceleration		✓	n/a	n/a
HSM Available		✓	TBD	n/a
Advanced Secure container technology		✓	n/a	n/a
Isolated Compute Environment			✓	n/a
Multi-Geo			✓	✓

Support-only Plans

- Looking for **IBM support on Hyperledger Fabric**?
  - IBM produces signed Hyperledger Fabric images which can be supported for production usage outside of IBM Cloud
  - Available for LinuxONE (IBM Z), Power and x86 architectures
  - Subscription term one year

- **Elite tier** (5737-E89/DV13ALL)
  - Supported 24x7x365; response target within 2 business hours
  - Multiple technical contacts and developer assistance
  - Yearly cost $24,000 per peer

- **Entry tier** (5737-E90/DV13BLL)
  - Support hours Monday – Friday 8am-5pm local time; response target within 8 business hours
  - Single technical contact
  - Yearly cost $6,000 per peer

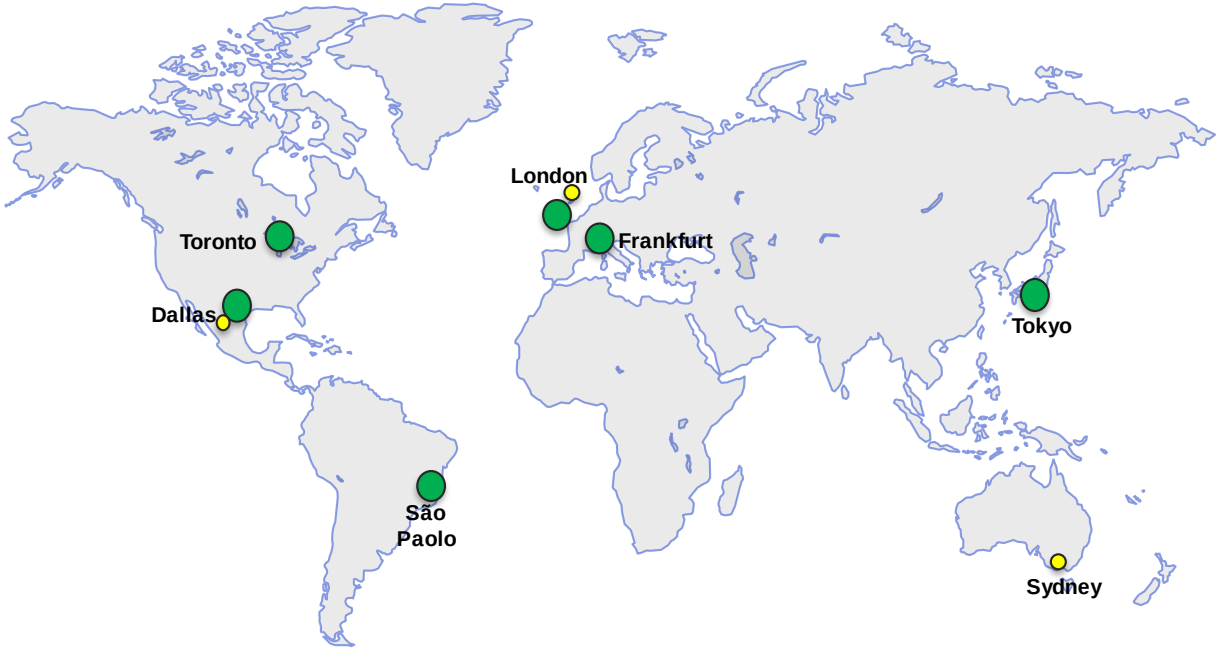
https://hub.docker.com/u/ibmblockchain/

Self Managed

Deploy individual components of the blockchain network to the environment of your choice using IBM signed Docker images

Support-only option for running a Hyperledger Fabric blockchain network

IBM Blockchain Platform Sites



IBM Blockchain Platform Enterprise plan is hosted in multiple sites to help you satisfy data residency requirements

IBM Blockchain Platform Starter plan is also hosted worldwide, to get you going quickly

Complemented by a set of IBM Blockchain Garages for hands-on assistance getting started with IBM Blockchain Platform

For the latest list, see https://console.bluemix.net/docs/services/blockchain/reference/ibp_regions.html

IBM Blockchain Platform Overview

What you need to know

Roadmap

IBM's blockchain strategy and where the platform is going

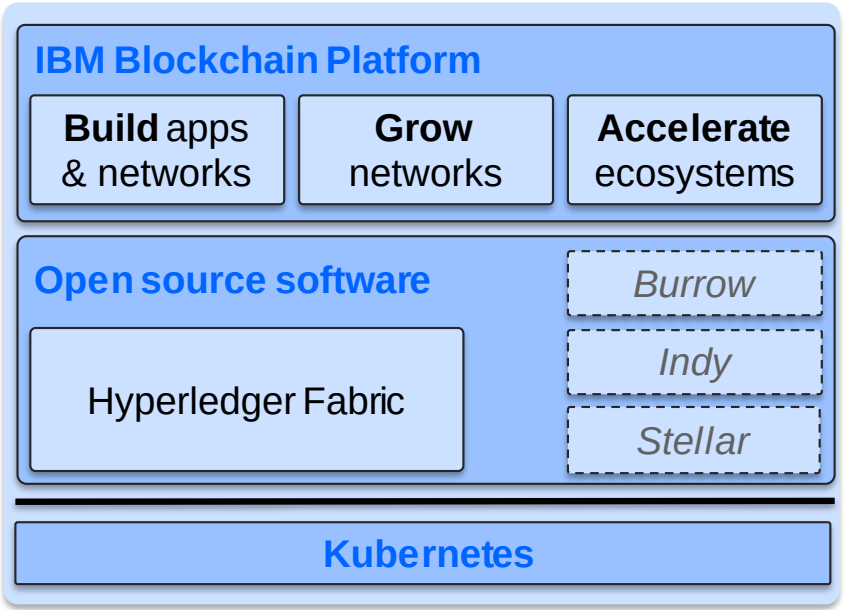
Technical Details

The architecture behind BM Blockchain Platform

IBM Blockchain Platform – 2018 Strategy

IBM Blockchain Platform is the catalyst that enables true blockchain innovators to disrupt industries:

- **Best in market tools** to quickly build, launch, run enterprise applications on blockchain networks
- **Accelerated progression** path from POC to production by making it easy to create & join networks, integrate existing applications, and grow the ecosystem
- **Flexible deployment options** on Kubernetes architecture



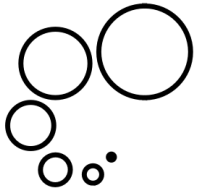
Under consideration

Core Capabilities for 2018

The IBM Blockchain Platform will give users the ability to …

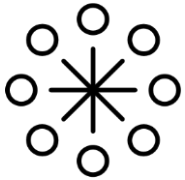
Build Apps & Networks

- **Development tools** to create applications which leverage blockchain networks
- **API endpoints and SDKs** for building and monetizing blockchain apps
- **Model for founders** to create business models enabled by blockchain



Grow Networks

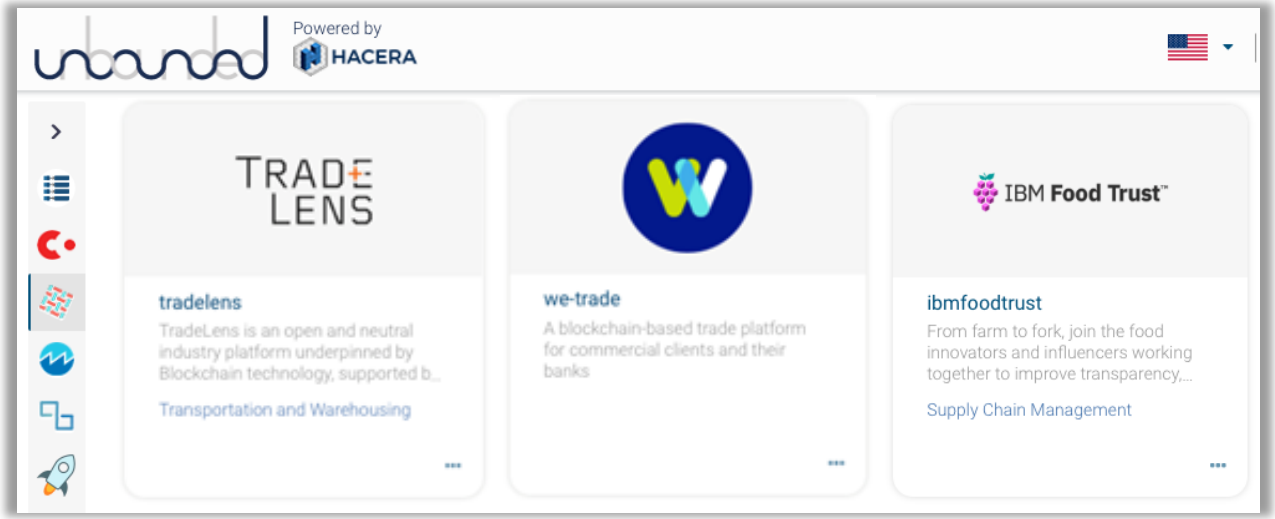
- **Operational tools** to test, manage, monitor, troubleshoot, deploy, migrate, and upgrade blockchain networks
- **Governance tools** to create and manage governance policies on permissioned networks



Accelerate Ecosystems

- **Network registry** to discover and join existing blockchain networks
- **Marketplace** to discover and use APIs, service components and applications
- **Public networks** to accelerate blockchain ecosystems

HACERA's Unbounded Registry

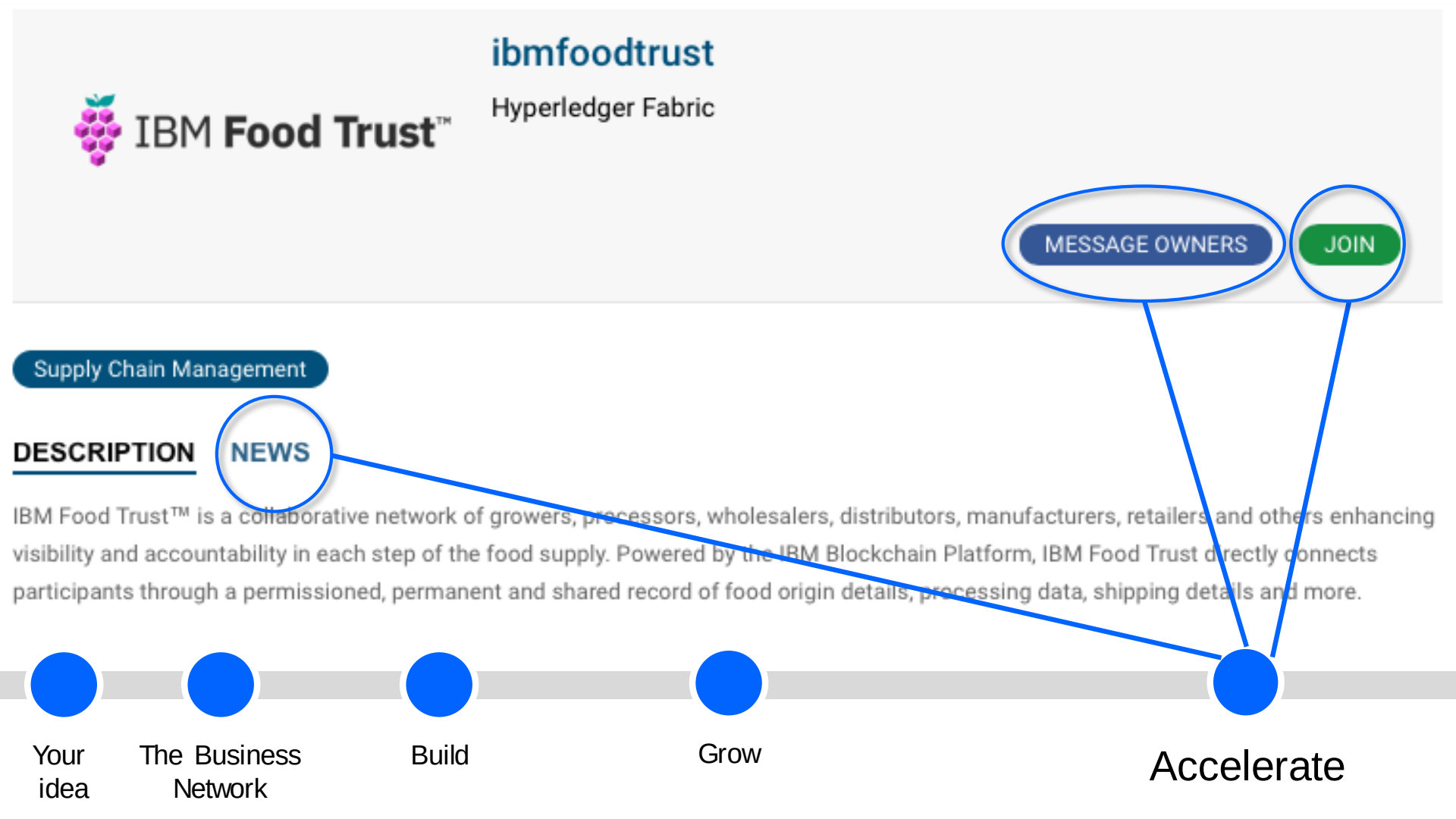


Network founders can:
- Publish network and joining details

Network joiners can:
- Find networks
- Connect & Join
- Discover services (and smart contracts)

The yellow pages for blockchain networks!

- IBM is a founding member of the Unbounded Registry
- Reserved naming for networks, applications and consortiums.
- The discoverability of blockchain networks and applications.
- A catalogue of domain-specific functions and services.
- An independent, open and shared blockchain backed platform to help us all with bootstrapping, launching and growing our communities.
- https://unbounded.network


IBM Food Trust™
ibmfoodtrust
Hyperledger Fabric
MESSAGE OWNERS
JOIN
Supply Chain Management
DESCRIPTION
NEWS
IBM Food Trust™ is a collaborative network of growers, processors, wholesalers, distributors, manufacturers, retailers and others enhancing visibility and accountability in each step of the food supply. Powered by the IBM Blockchain Platform, IBM Food Trust directly connects participants through a permissioned, permanent and shared record of food origin details, processing data, shipping details and more.
Your idea
The Business Network
Build
Grow
Accelerate

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

Simplicity — Flexibility

IBM Blockchain Platform

One Platform Experience
Cost varies

In an effort to simplify our offerings, all IBP 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 IBP offering 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

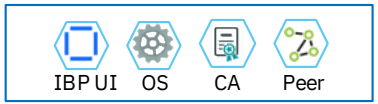
Peers Deployed on customer's Choice Environment

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;
IBP Infrastructure: IBM Cloud with custom options
Configuration: Default with optionality
Software lifecycle: IBM manages IBP & associated components, customer manages the Peer

Full Network

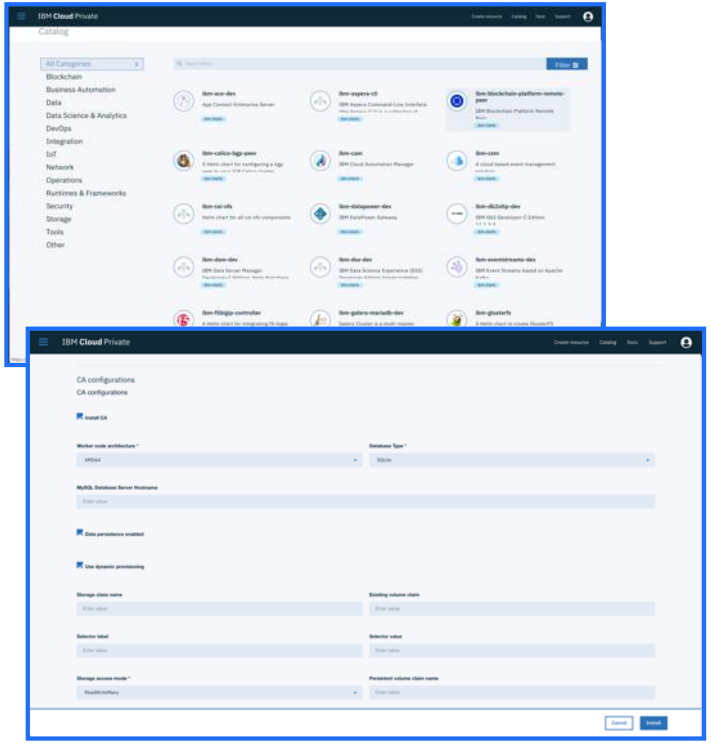
IBP & Components Deployed on customer's Choice Environment



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. *This is not a 'production' suitable environment yet as it only has SOLO, updates will be included with UI release*
Component	Peer	Peer Ordering Service (Solo) CA (Single)
Infrastructure	IBM Cloud Private (Linux 64-bit & IBM Z/LinuxONE)	

IBP Anywhere on a page

Context

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 clouds.

\+

Control over Data

Increasing number of regulations (e.g. GDPR) and concerns about privacy are impacting 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.

Solution

IBM is expanding its offering with the first Enterprise-grade multi-cloud blockchain platform with on-premises deployment capabilities.

IBM Blockchain Platform for	Offering Roadmap				
	Distributed Ledger (Peer)	Full Dev Fabric Network	Full Production Fabric Network & UI	Deployment to SSC4ICP (Secure Service Container)	HSM Integration
IBM Cloud Private	4Q18	4Q18	TBA		
Z Unique Features				TBA	TBA

Source: https://www.ibm.com/blogs/cloud-computing/2018/02/15/multicloud-era-team-ready/

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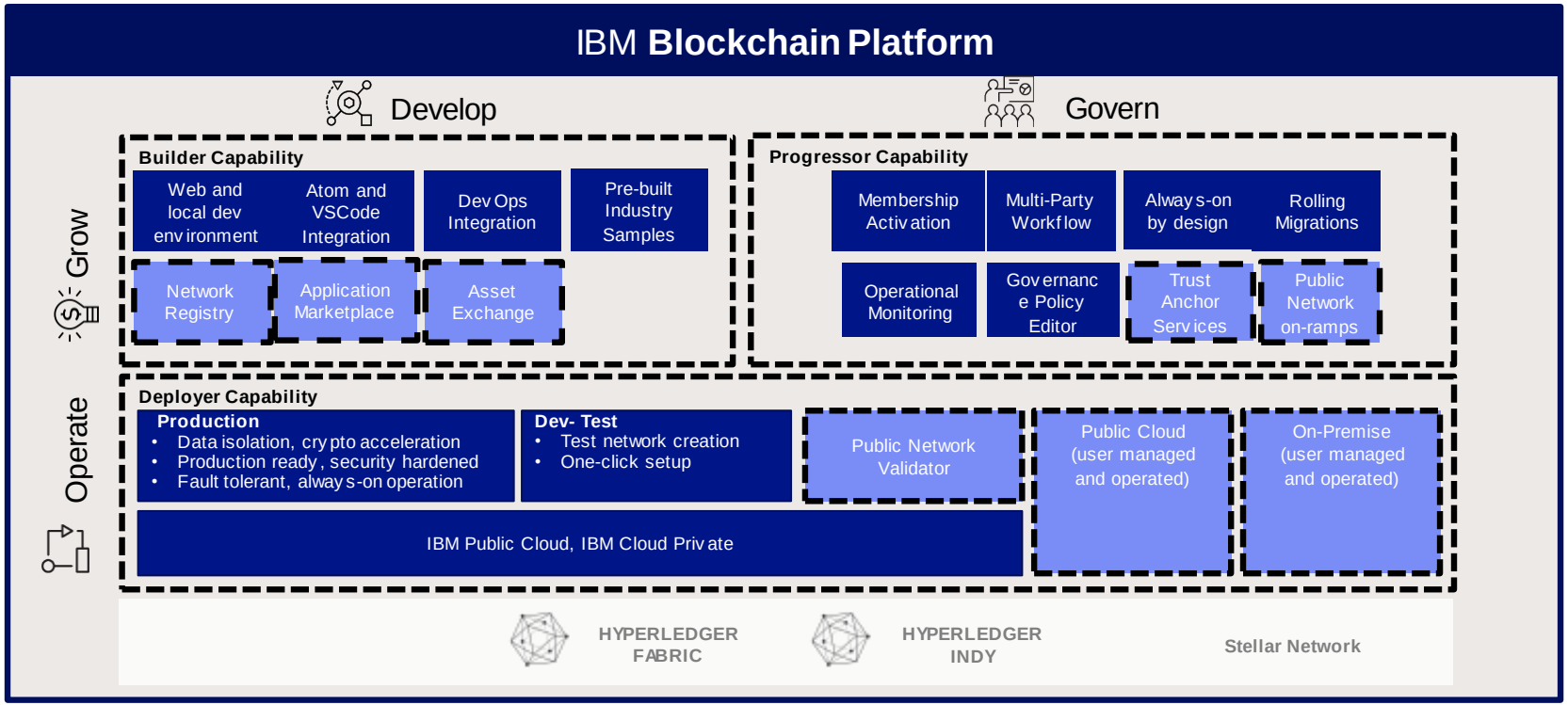
IBM Blockchain Platform

Solutions	Food Trust, universal payments, Global Trade Digitization, Identity, etc…
IBM Extensions	Watson IOT, API Management, Messaging, Workflow etc…



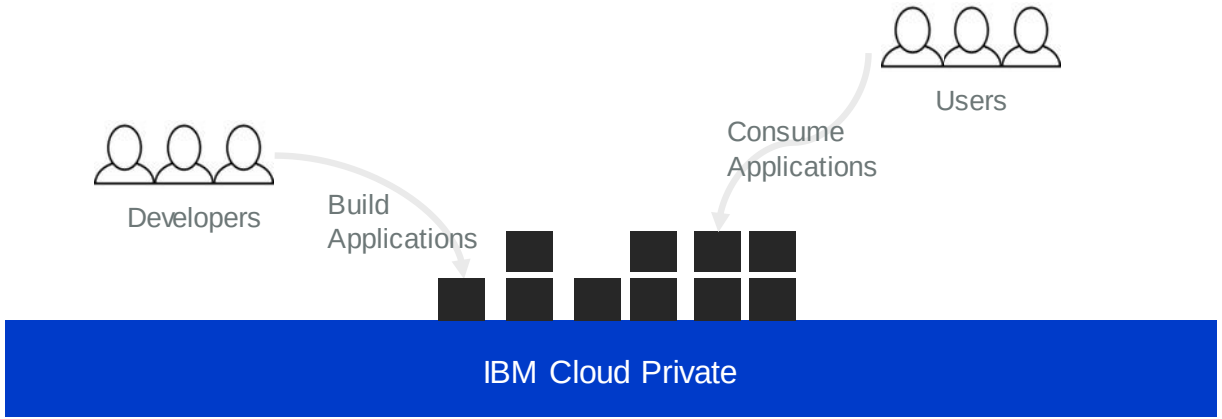
Included in IBM Blockchain Platform Coming Soon

IBM Cloud Private: Overview

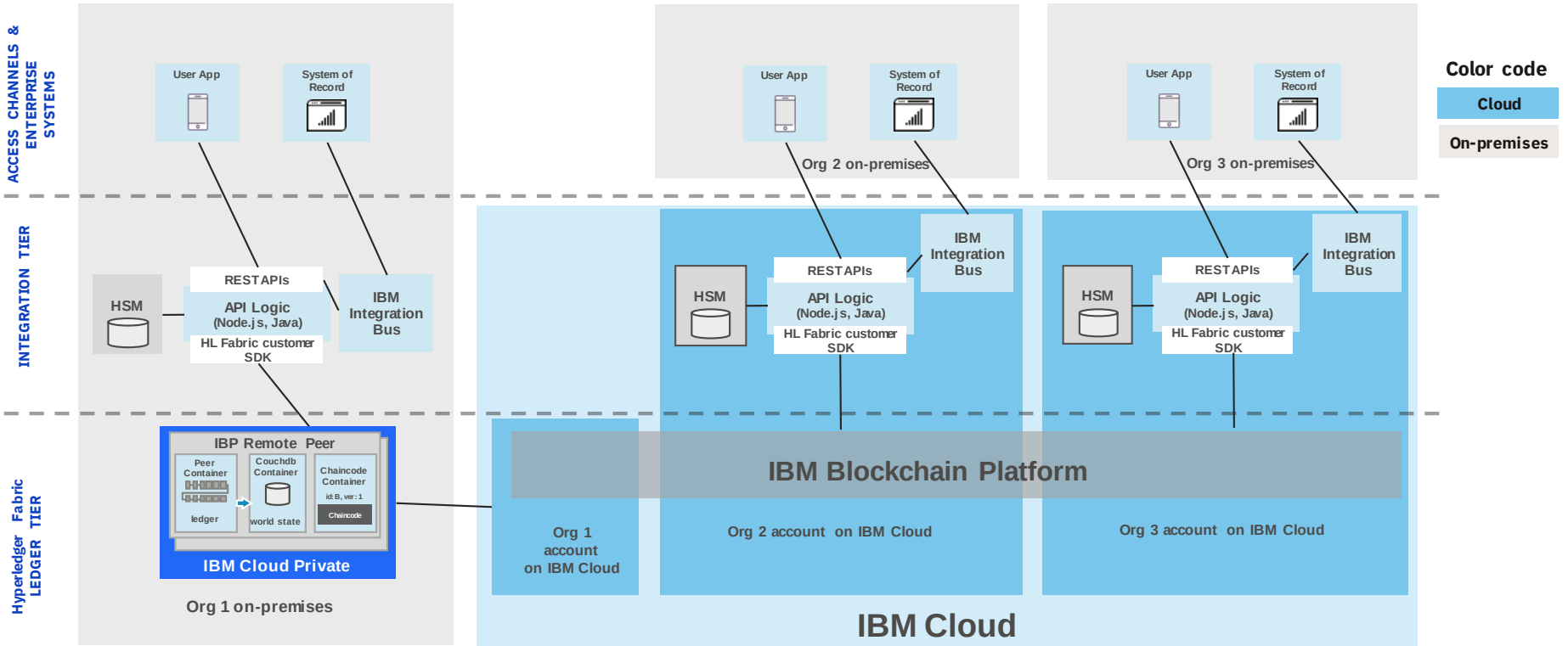
IBM Cloud Private is an application platform for developing and managing on-premises, containerized applications. It includes the container orchestrator Kubernetes, a private image repository, a management console, and monitoring frameworks.

IBM Cloud Private is a platform that brings together tools and infrastructure for developers to build compelling, scalable applications for users

- Value of Platforms: Platforms derive value from the amount of meaningful workload that is created and run on that platform
  - Rules: Quality workload on the platform → more users → more workloads
  - We capture value when customers deploy more workloads to ICP and our pricing metrics align to that



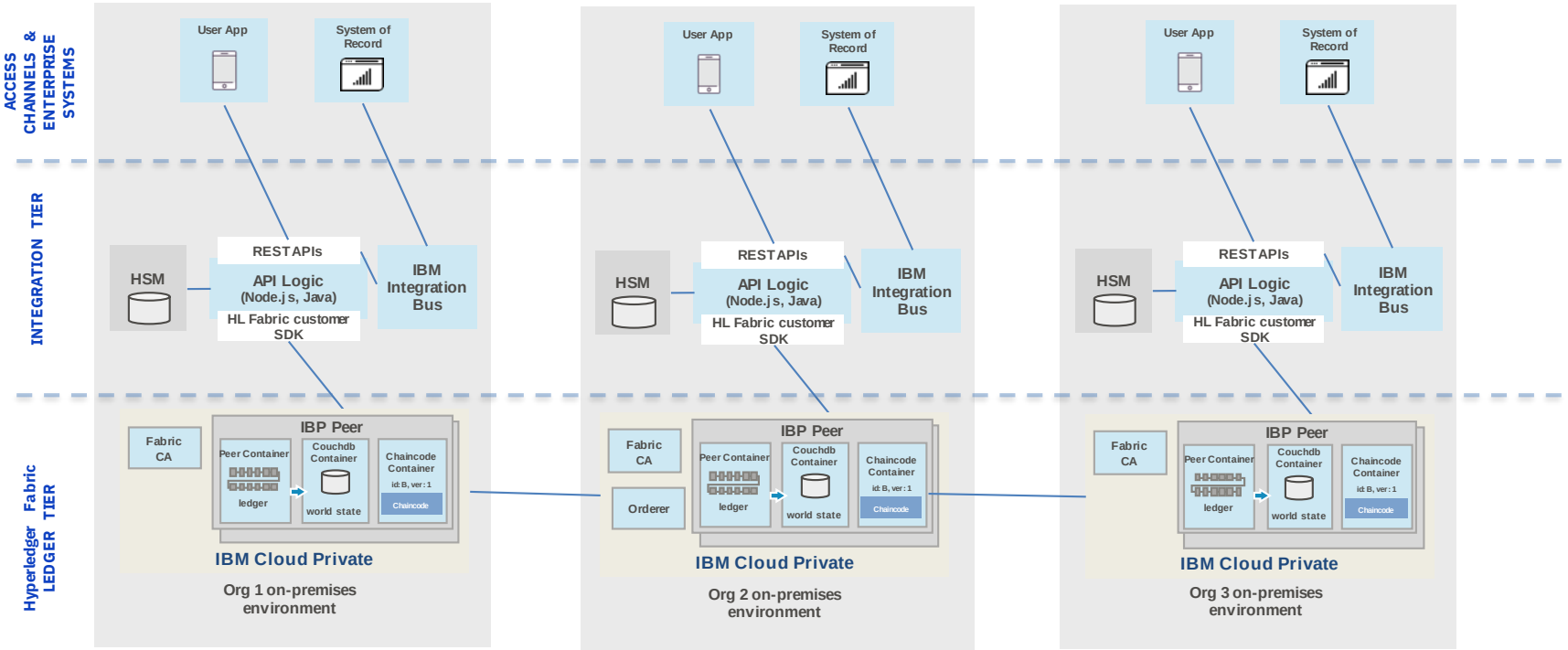
IBM Blockchain Platform SaaS + Distributed Peer



* Not all connections are shown

Try & Buy, Trade-up parts can be added later

IBM Blockchain Platform: Full Fabric Network



* Not all connections are shown

Try & Buy, Trade-up parts can be added later

Security is implemented at each layer of the architecture

Secure Hardware

Hardware Security Module

Encrypted Storage

Secure Services Containers

Membership Services

Secure Comms

Consensus

Hyperledger Fabric

Security is implemented at each layer of the architecture

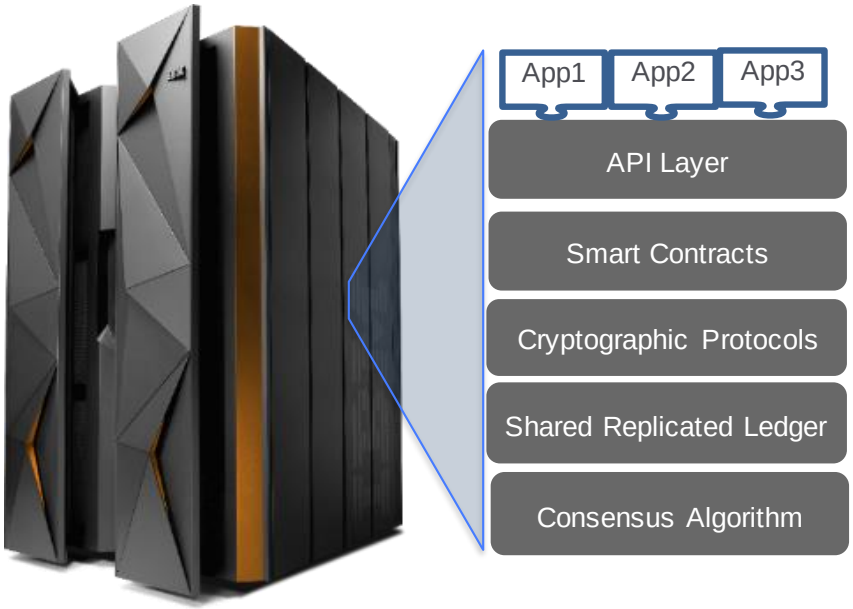
- Hyperledger Fabric
  - Membership Services: Organizations are invited to join and authenticated using an Enrollment Certificate
  - Transaction Consensus: Each transaction is endorsed and validated by multiple peers before committing to the ledger
  - Controlled Ledger Access: Channels restrict transactions to a set of organizations that are shared on the ledger
  - Secure Communications: Between the end-user application and smart contract is secure
  - Extensive security scans and audits performed by IBM, and independently by IBM and Linux Foundation sponsored 3rd-party penetration testing and code audits

- Secure Service Containers
  - Secure appliance framework providing infrastructure services encapsulating the Hyperledger Fabric
  - No root access: Access system and software only through API's; even trusted administrators
  - Impervious to the injection of malware: Installed from encrypted, signed boot image
  - Data Privacy: Encryption of data in flight and at rest on the ledger

- Secure Performant Hardware
  - Hardware Security Module (HSM) is certified to FIPS 140-2 level 4
  - Fastest cryptographic acceleration: used by block hashing and digital signatures

Blockchain benefits from running on IBM Z® & LinuxONE™

Superior performance and highest security certifications that meet the strictest requirements for government, healthcare, financial services, & insurance



Global Security Compliance

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

Common Criteria EAL5+ security certification

- Rigorous testing and evaluation

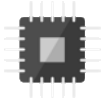
Large Memory (32 TB)

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

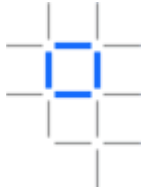
Lowest Latency

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

Why run IBP for ICP on LinuxONE: Security!

Workload Isolation		Tamper-proof firmware also provides highest level of multitenant workload isolation
Integrated Crypto Hardware		In-core hardware-accelerated encryption that is 2x – 7x as fast as x86 True Random Number Generator (TRNG) PCIe Hardware Security Module (IBM Crypto Express6S) designed to meet FIPS 140-2 Level 4
Key Encryption & Management		The IBM Enterprise Key Management Foundation (EKMF) provides real-time, centralized secure management of keys and certificates
Data Encryption		Broadly protect Linux file systems using policy controlled encryption that is transparent to applications and databases
Network Encryption		Protect network traffic using standards-based encryption from end-to-end Hardware-accelerated network encryption algorithms (e.g. SSL/TLS, VPN/IPSec, etc.)
Time Source Security		Protects against falsifying or altering time information

Further information



- Platform Information
  - https://www.ibm.com/blockchain/platform/
- Technical Overview
  - https://www-01.ibm.com/marketing/iwm/dre/signup?source=urx-20950&S_PKG=ov61731
- Platform Service
  - https://console.bluemix.net/catalog/services/blockchain
- Platform Service Level Agreement
  - http://www-03.ibm.com/software/sla/sladb.nsf/pdf/6605-12/$file/i126-6605-12_11-2017_en_US.pdf
- ISO Certification
  - https://www-935.ibm.com/services/multimedia/saas_27k.pdf
  - https://www-935.ibm.com/services/us/en/it-services/pdf/ibmcloud_27017.pdf
  - https://www-935.ibm.com/services/multimedia/ibmcloud_27018.pdf

Thank you

Guillaume Lasmayous – guillaume.Lasmayous@fr.ibm.com
IT Specialist, Blockchain Center of Competency
IBM Client Center Montpellier, France

Guillaume Hoareau – guillaume_hoareau@fr.ibm.com
IT Architect, Security
IBM Client Center Montpellier, France

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