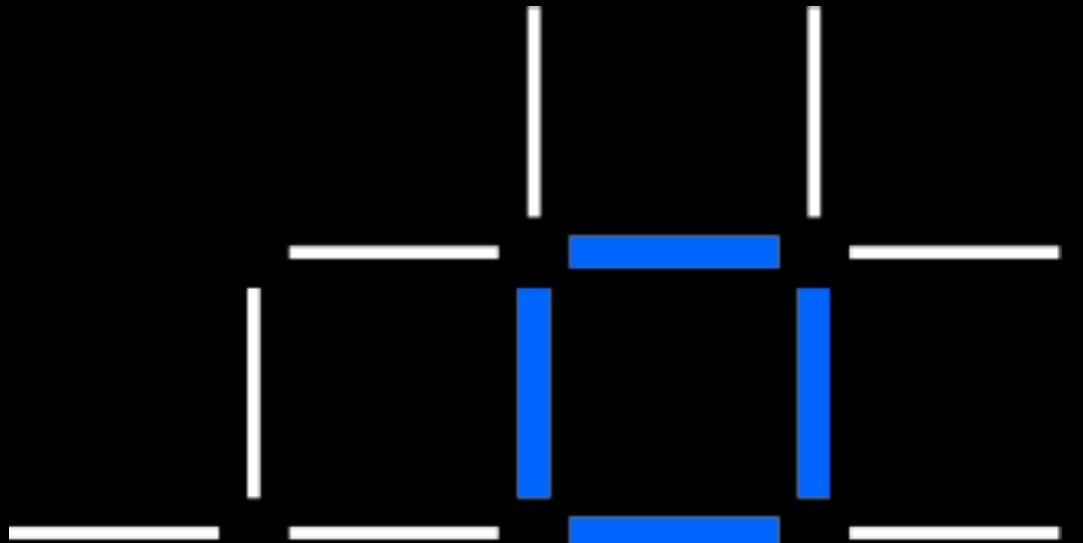


How to create a supply chain Blockchain App

Introduction

*Lennart Frantzell, IBM Developer Advocate, SF
Grant Steinfield, IBM Developer Advocate, NYC*



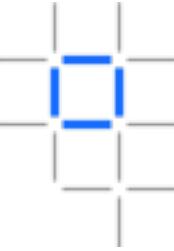
IBM Blockchain Platform Technical Series

-  Technical Introduction
-  Using IBM Blockchain Platform
-  **Modeling Blockchain Applications**
-  Architectural Good Practices
-  What's New in Technology

Feb 22 2020

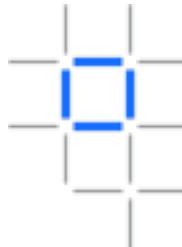
IBM Blockchain

IBM

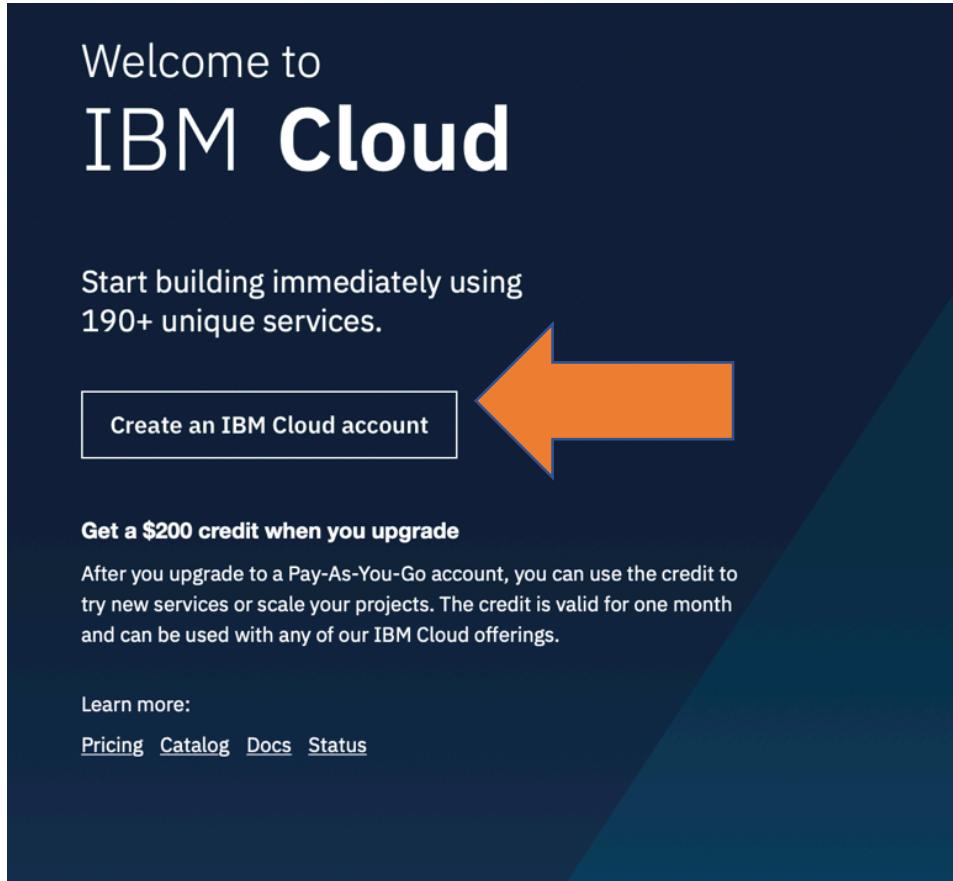


- 1. Workshop level: intro**
- 2. 30-second pitches**

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<https://ibm.biz/BdqDWA>



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Start building immediately using
190+ unique services.

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Get a \$200 credit when you upgrade

After you upgrade to a Pay-As-You-Go account, you can use the credit to try new services or scale your projects. The credit is valid for one month and can be used with any of our IBM Cloud offerings.

Learn more:
[Pricing](#) [Catalog](#) [Docs](#) [Status](#)

An orange arrow points from the "Create an IBM Cloud account" button on the left side of the page towards the "Create an IBM Cloud account" button on the right side of the image.

Log in to IBM Cloud

ID

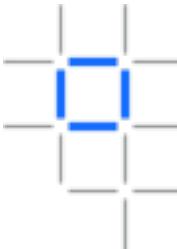
IBMid ▾

Remember me

[Forgot ID?](#)
[Forgot password?](#)

[Continue](#)

Blockchain Platform in the IBM Cloud Catalog



IBM Cloud

Blockchain Platform

Author: IBM • Date of last update: 02/06/2020 • [Docs](#) • [API docs](#)

[Create](#)

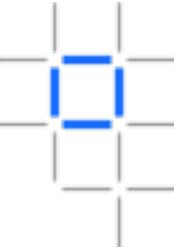
About

Pricing plans

Displayed prices do not include tax. Monthly prices shown are for country or region: [United States](#)

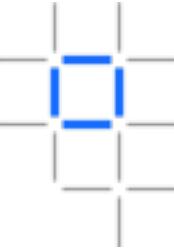
Plan	Features	Pricing
Standard	All the tooling you need to build, operate, and grow your blockchain solution.	\$0.29 USD/Virtual Processor Core-Hours 

Quickly progress from development, to pilot, to production with a single plan that scales as you grow. Please note that you will be charged additionally for infrastructure and storage. File storage will be provisioned unless you change your Kubernetes storage preferences. Learn how to preview the platform for free on the "About" page of the cloud catalog.



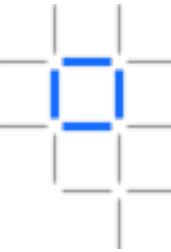
You can also run Hyperledger Fabric natively in Kubernetes. Free for 30 days

- The IBM Blockchain Platform is based on the Hyperledger Fabric.



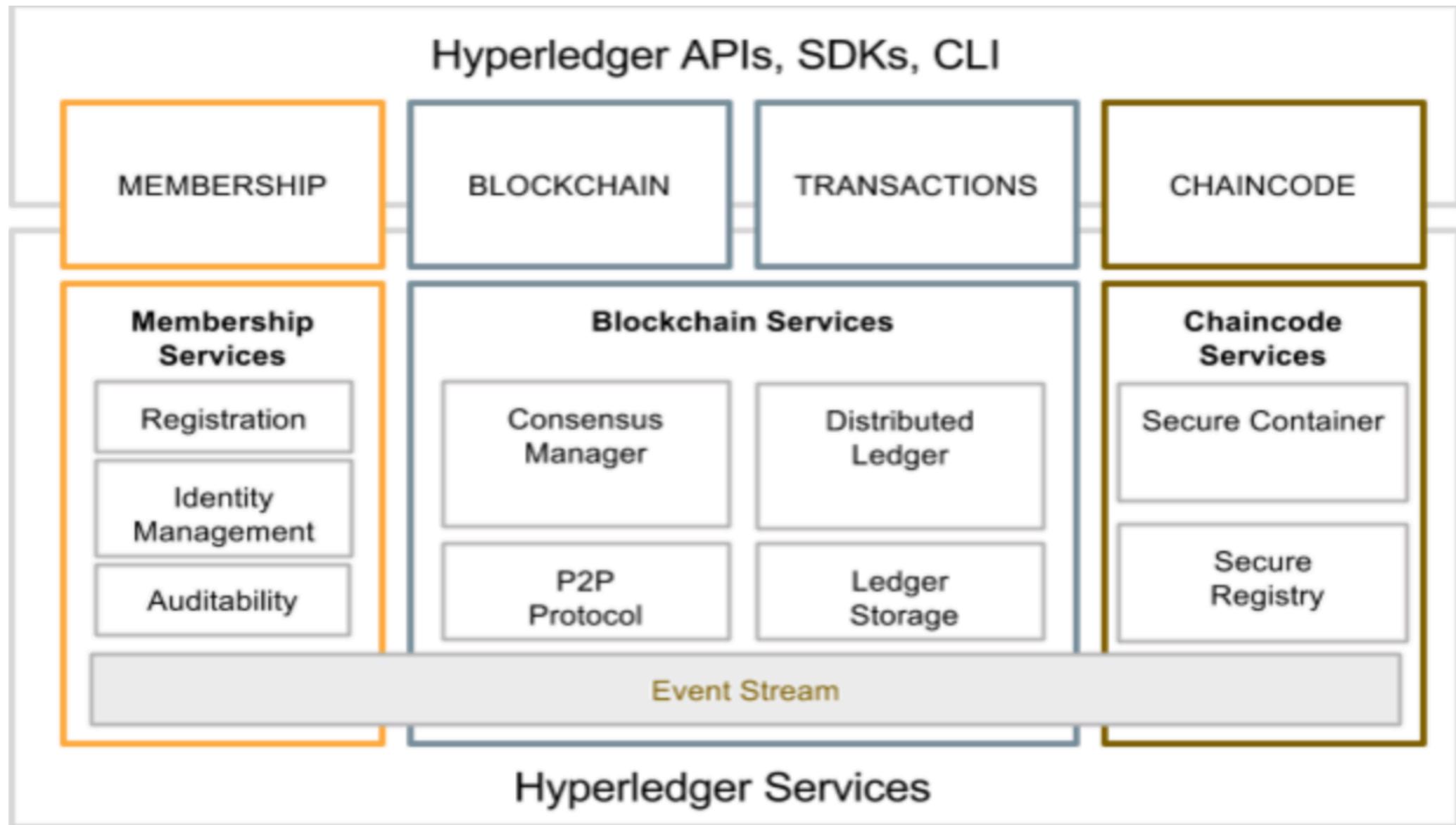
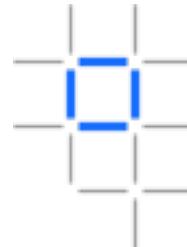
And now let's go through the IBM Blockchain Platform architecture

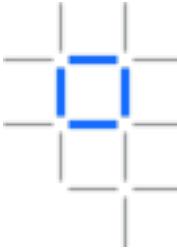
Open Source Hyperledger Fabric



- **Hyperledger Fabric – from The Linux Foundation – is the modular blockchain framework** that has become the de facto standard for enterprise blockchain platforms.
- It offers a unique approach to consensus that enables **performance at scale** while also preserving the data privacy enterprises demand.
<https://www.hyperledger.org/resources/publications/blockchain-performance-metrics>
- **Open source and open governance**
- <https://hyperledger-fabric.readthedocs.io/en/release-2.0/>
- <https://www.hyperledger.org/projects/fabric>

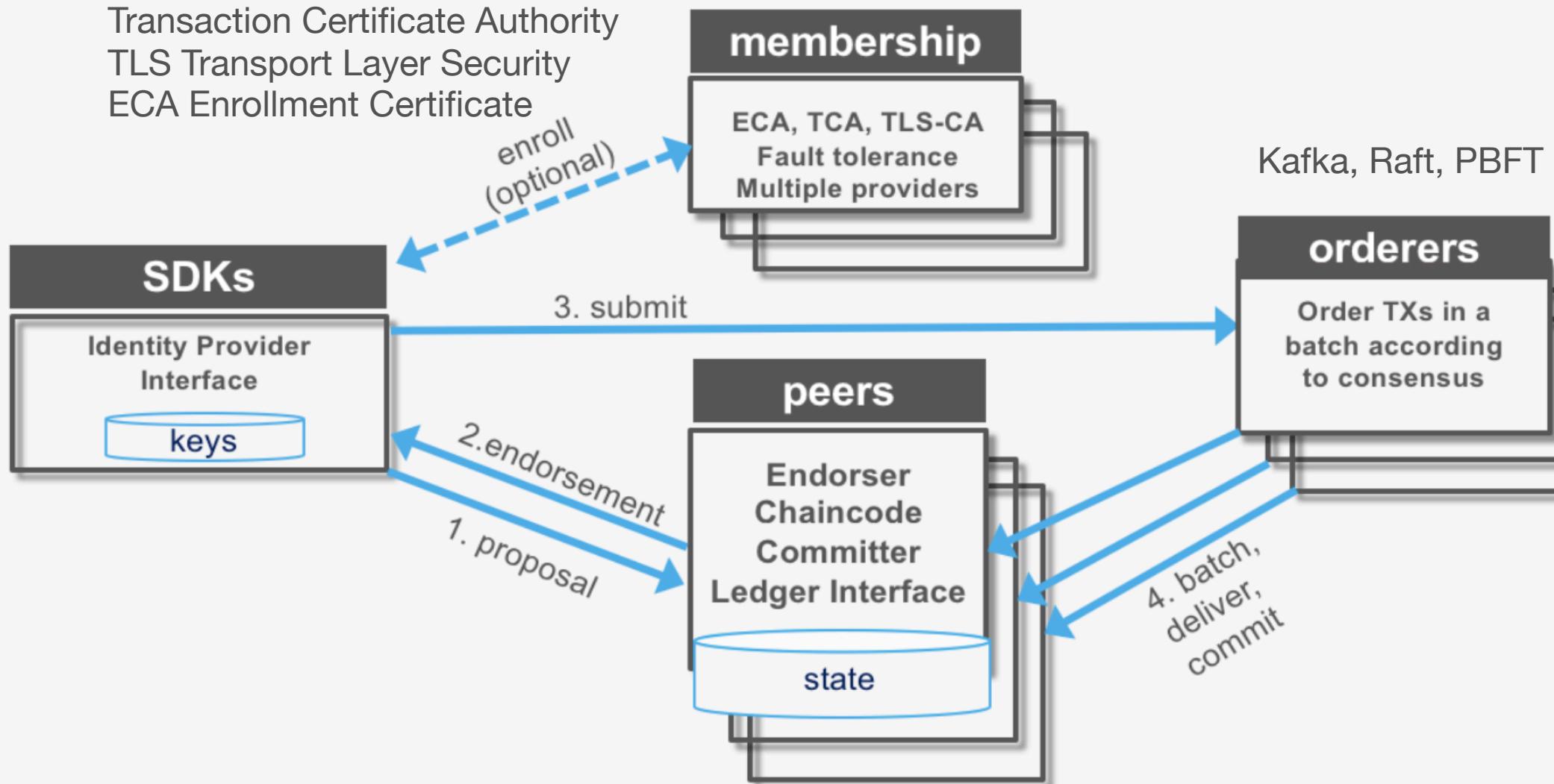
Hyperledger Fabric



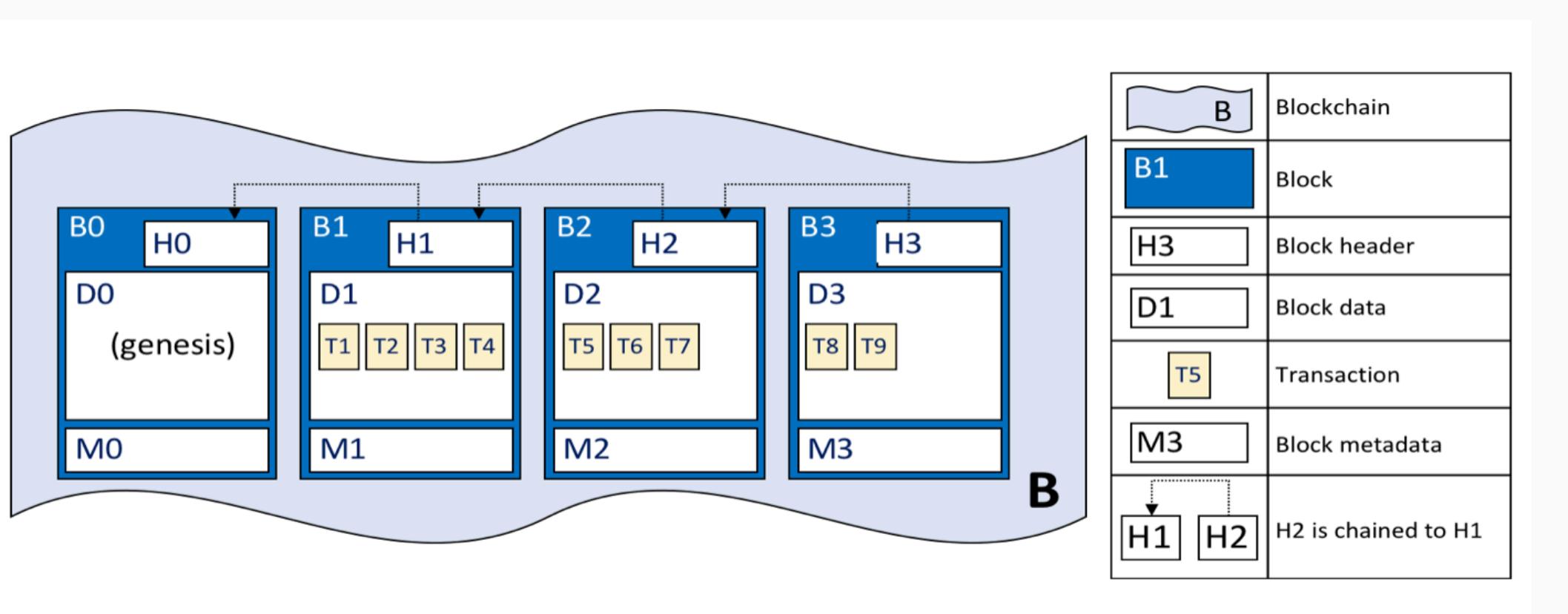
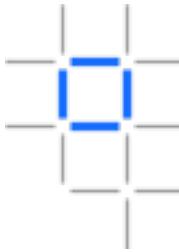


Hyperledger Fabric

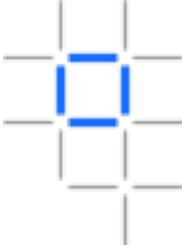
Transaction Certificate Authority
TLS Transport Layer Security
ECA Enrollment Certificate



The Blockchain

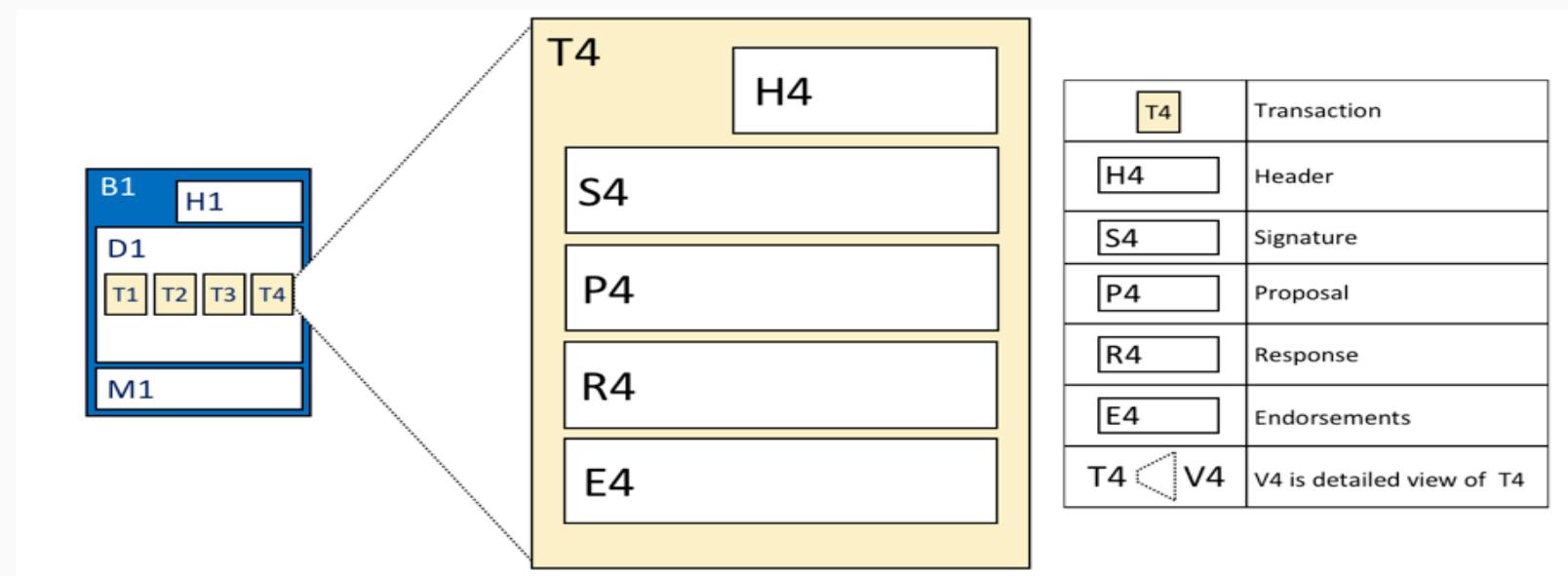


A *blockchain B* containing blocks *B0, B1, B2, B3*. *B0* is the first block in the blockchain, the *genesis block*.



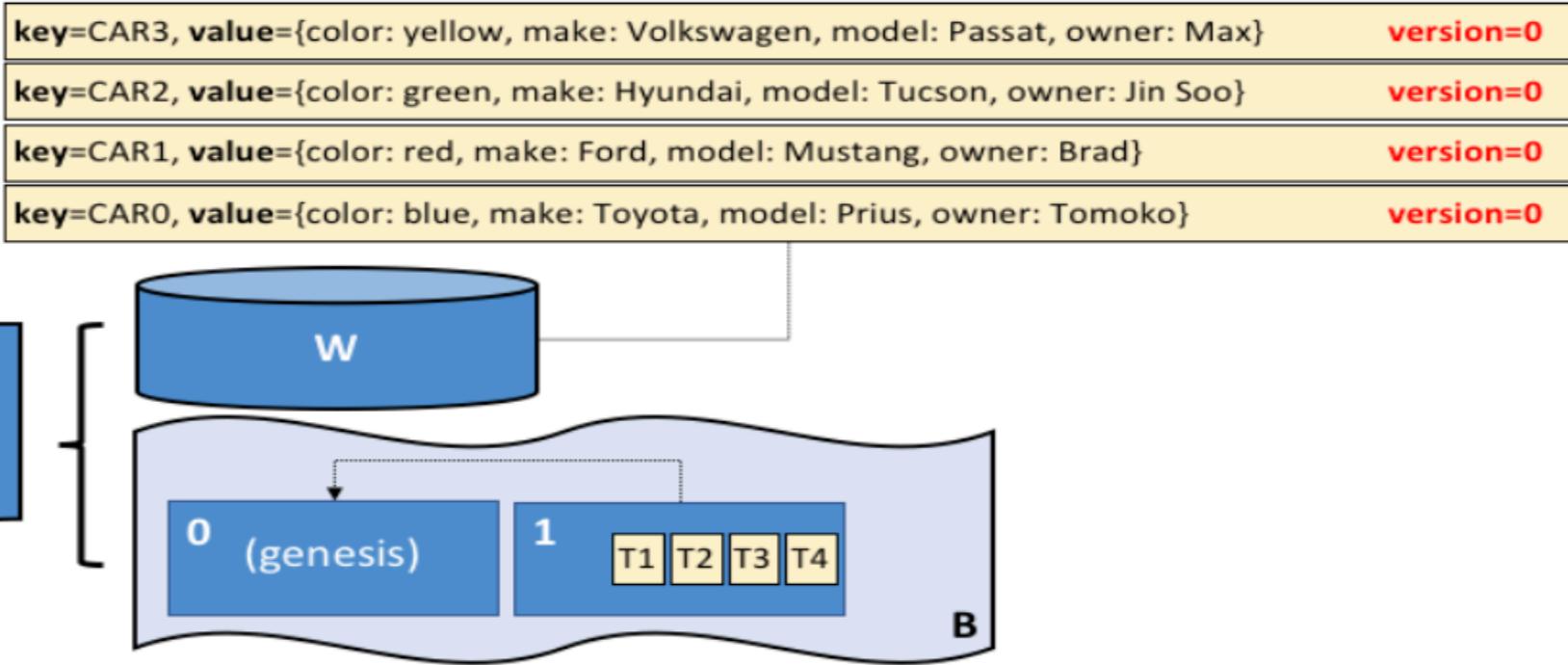
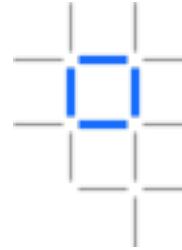
Transactions

As we've seen, a transaction captures changes to the world state. Let's have a look at the detailed **blockdata** structure which contains the transactions in a block.



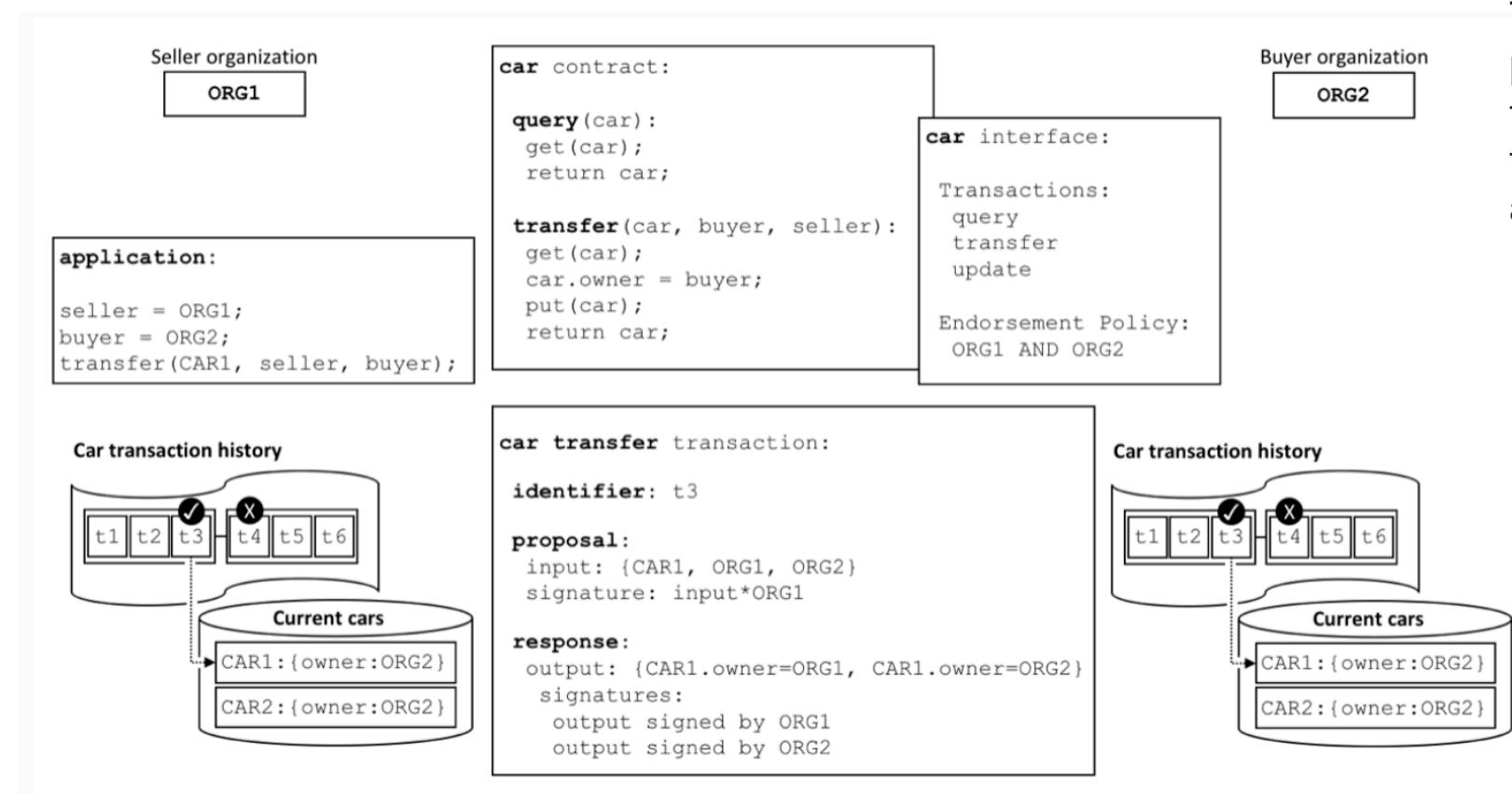
Transaction details. Transaction T4 in blockdata D1 of block B1 consists of transaction header, H4, a transaction signature, S4, a transaction proposal P4, a transaction response, R4, and a list of endorsements, E4.

So what makes a Blockchain a Ledger?



The ledger, L, comprises a world state, W and a blockchain, B. W contains four states with keys: CAR1, CAR2, CAR3 and CAR4. B contains two blocks, 0 and 1. Block 1 contains four transactions: T1, T2, T3, T4.

Smart Contract



All transactions have an identifier, a proposal, and a response signed by a set of organizations. All transactions are recorded on the blockchain, whether valid or invalid, but only valid transactions contribute to the world state.

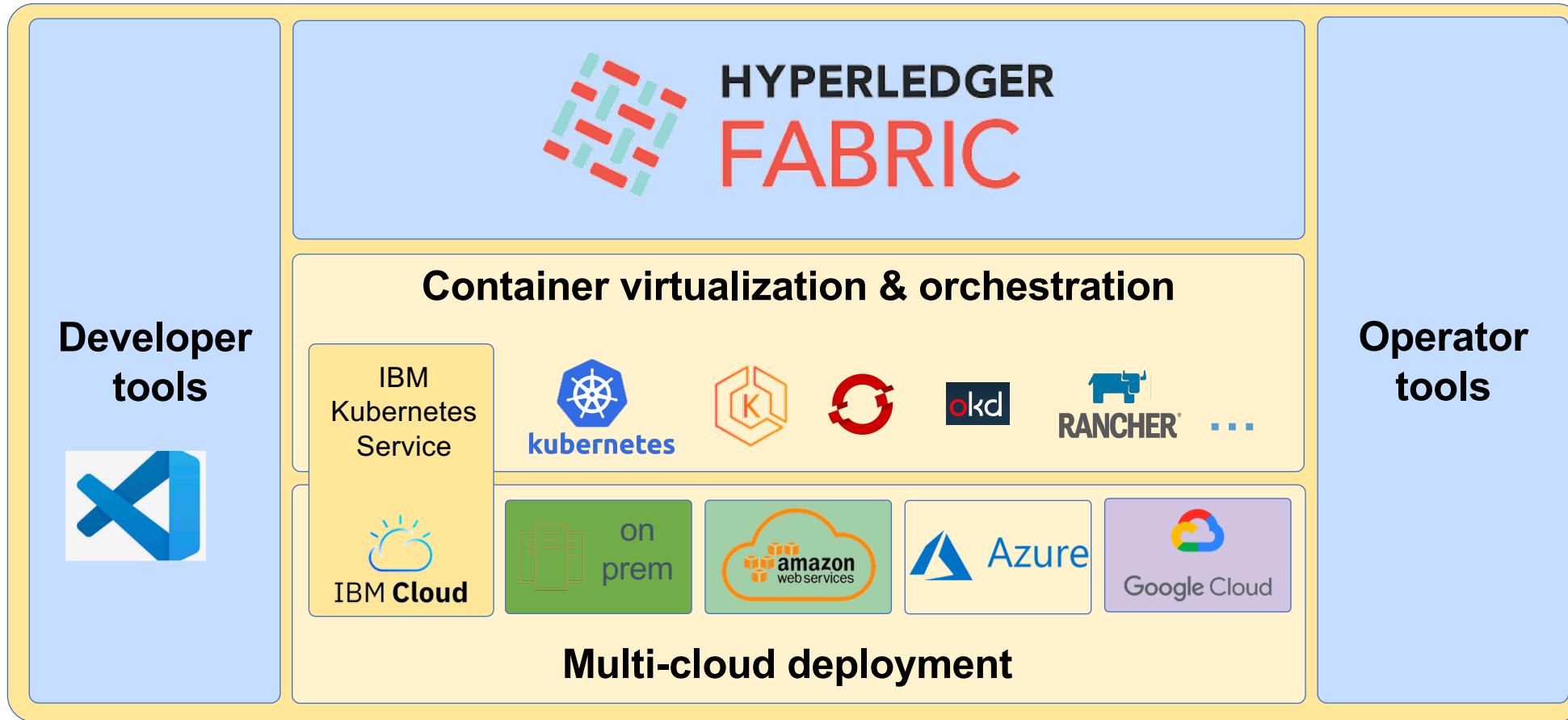
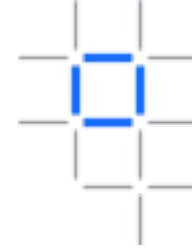
Hyperledger Fabric allows users to define policies around the execution of chaincode.

These endorsement policies define which peers need to agree on the results of a transaction before it can be added to the ledger.



Introducing IBM Blockchain Platform v2.1.2

Build, operate and grow Hyperledger Fabric networks



Advanced tooling

Create & manage smart contracts,
applications & networks

IBM Blockchain

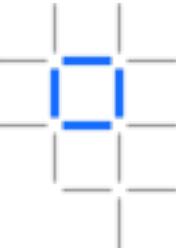
Open technology

Hyperledger Fabric,
Containers, Kubernetes

Deploy anywhere

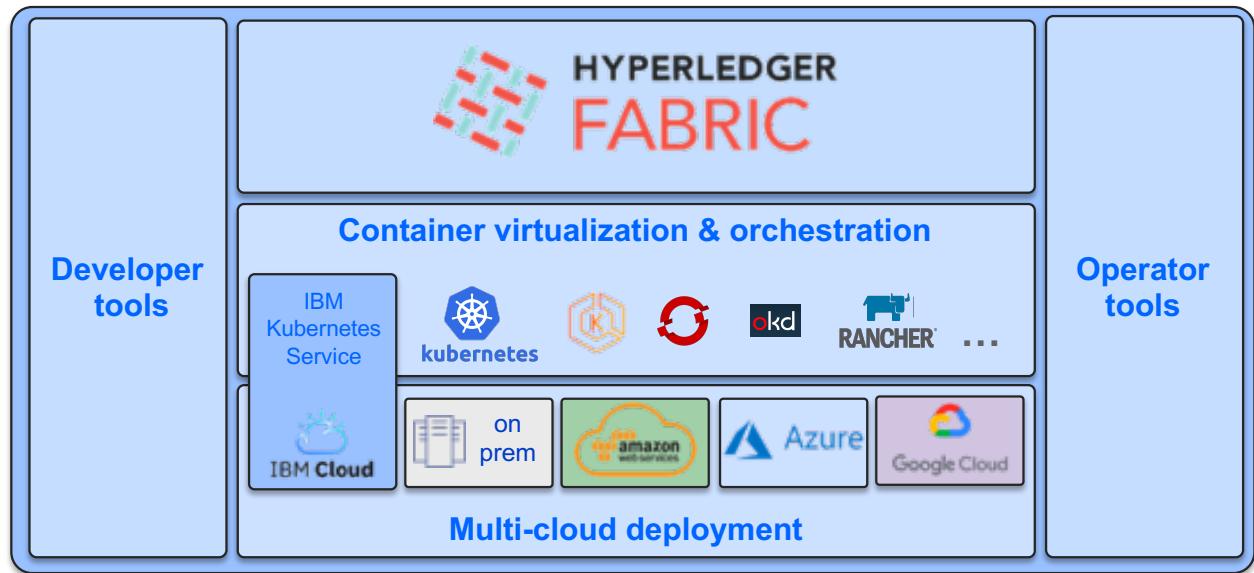
Comprehensive cloud &
on-premises options

IBM

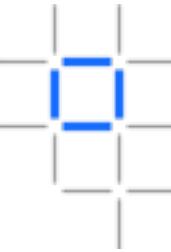


IBM Blockchain Platform Deployment Options

- There is just one IBM Blockchain Platform product regardless of where it is deployed
 - **It sits on a Kubernetes container infrastructure on your chosen provider**
 - Kubernetes provides common logging and management services of the IBM Blockchain Platform
- When run on **IBM Cloud**, the IBM Blockchain Platform uses the IBM Cloud Kubernetes Service
 - **Use the free IBM Kubernetes tier for a free IBM Blockchain Platform, or a paid IBM Kubernetes tier for a paid IBM Blockchain Platform; free tiers expire after 30 days**
- When deployed **on-premises** or on any **non-IBM cloud**, IBM Blockchain Platform deploys to Kubernetes v1.11
 - Examples include OpenShift, OKD, Rancher & AEKS



IBM Blockchain Platform is a key part of IBM's Blockchain Strategy



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



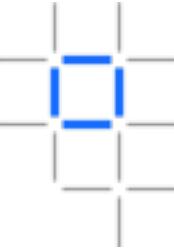
IBM Blockchain Platform

Build, operate and grow blockchain networks in heterogeneous environments



HYPERLEDGER

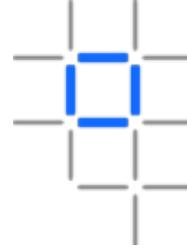
A founding, premier member of Hyperledger, IBM is committed to open source, standards & governance



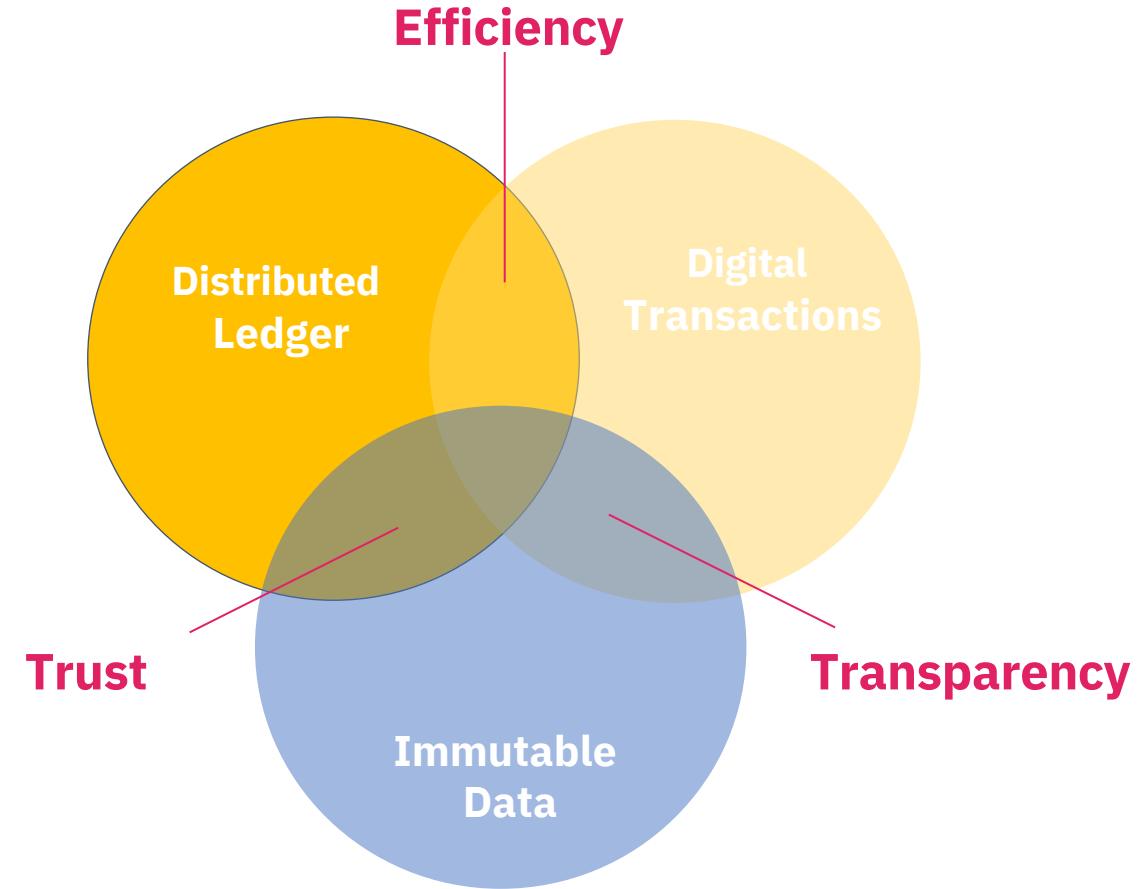
Supply Chain and Blockchain

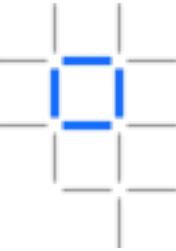
Poster Child

Introducing IBM Food Trust™ built on Blockchain technology



- The IBM Food Trust solution is a set of modules providing traceability to improve food transparency and efficiency
- Blockchain is used to create a trusted connection with shared value for all ecosystem participants, including end consumers
- The solution offers connectors for interoperability and leveraging existing standards (e.g., GS1)
- Blockchain properties come together to create a more trusted, transparent, and efficient data-sharing platform.



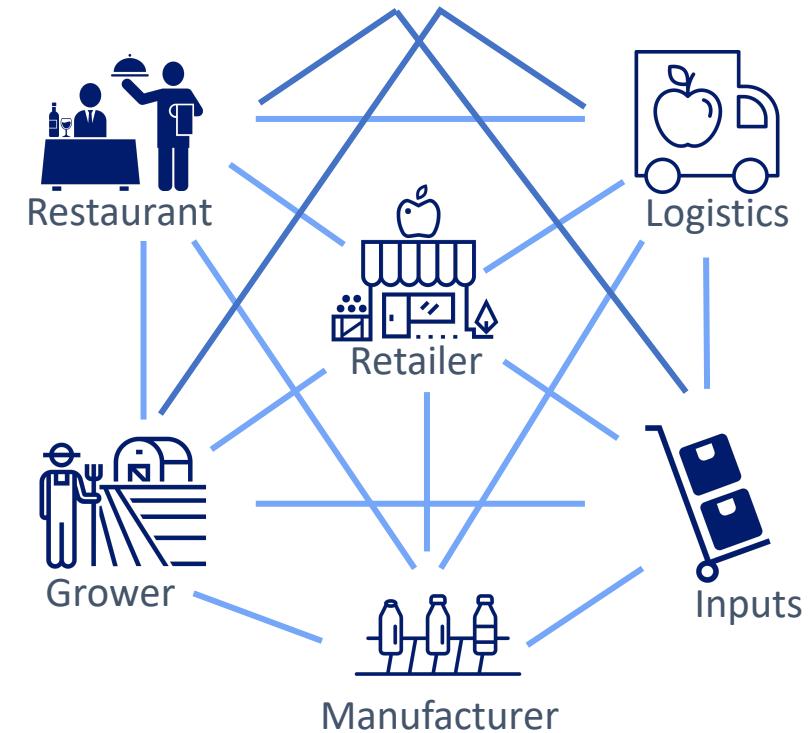


Today, traditional system constructs limit transparency

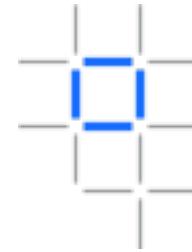
The Problem:

- Data is siloed within each company and accessing it requires a request and time
- Exchange of information takes place between a pair of partners; to get information from a distant partner may require intermediaries, time, resources
- Most transactions are still paper-based, creating inefficiencies and opportunities for fraud
- Because everyone maintains their own record of transactions, differences take time and resources to reconcile

The food industry today



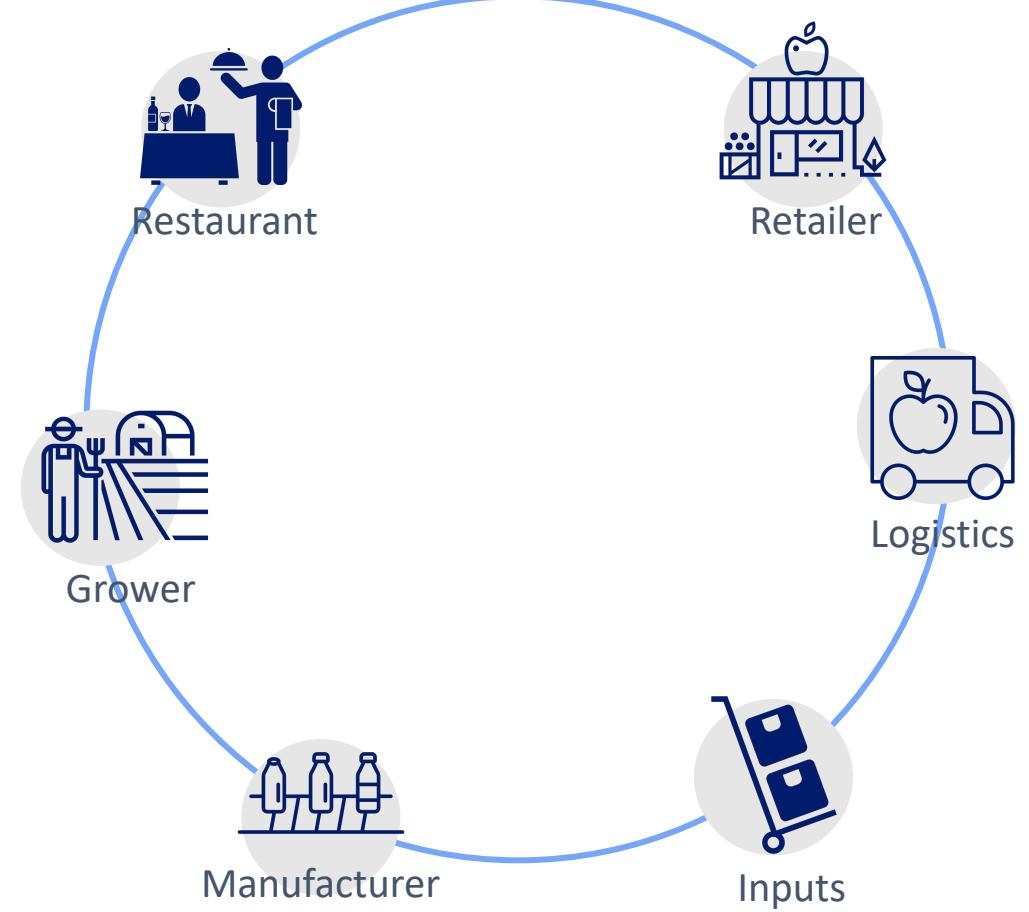
Blockchain transforms systems with trust and transparency

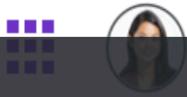


The Solution:

- Because blockchain provides an **independent data-sharing platform**, participants **trust it**
- Once data is shared in a single data-sharing platform, everyone has **instant transparency** into the transactions they are authorized to view; no intermediation required
- **Data immutability** creates an auditable record of all transactions, disincentivizing fraudulent behavior
- **Dispute resolution** from the shared ledger can be automated saving time and resources

The food industry with blockchain





X

Product name: GTIN:
Fresh Blueberries 00390290-bbery

Current inventory

Insights

Inventory

At risk

Dwell time

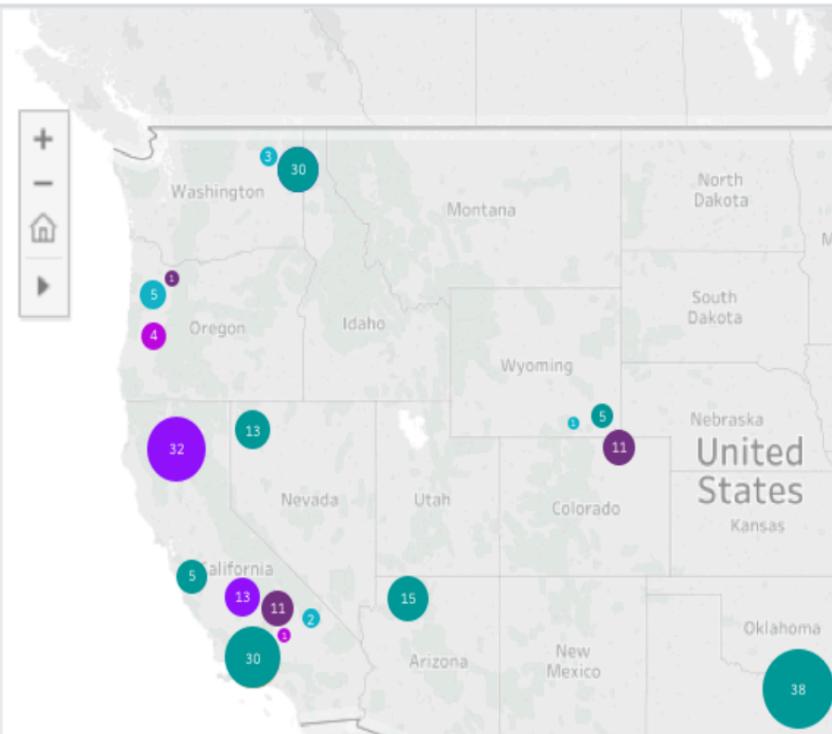
Time since production invented

Daily data interval, with a date range:

29th March 2018 - 20th May 2018

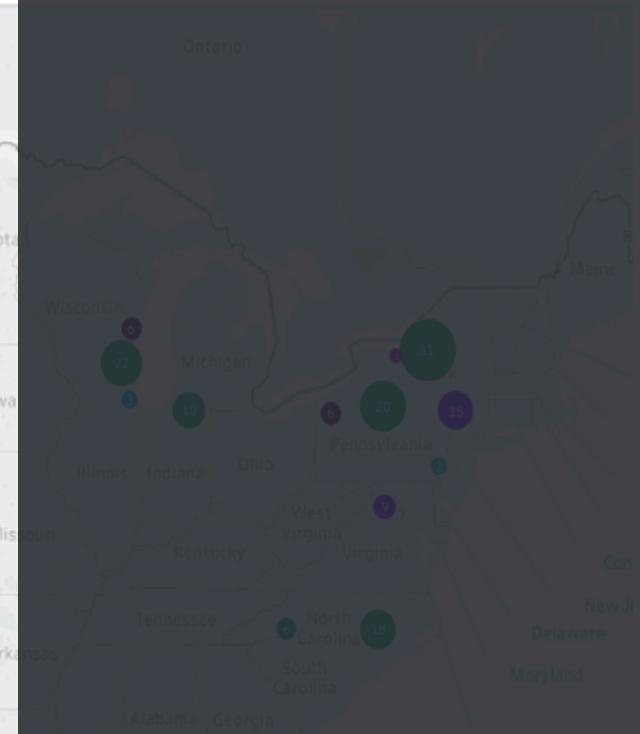
 Update

Facility	Total facilities
Farms	420
Packing houses	20
Manufacturing of goods	15
Warehouses	13
Stores	1,230

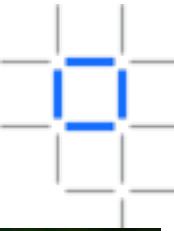


At-risk inventory data is provided at the product level.

- Clicking on the facilities allows you to see which facilities have at-risk inventory, and the details for at-risk products.

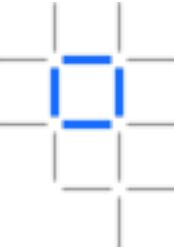


Coffee and Blockchain

A blurred background image showing coffee beans in various stages of processing, from raw green beans to roasted brown beans.

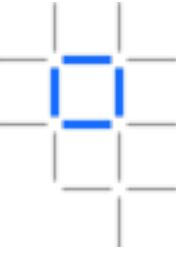
The
Blockchain
BEAN

IBM **Blockchain** in collaboration with  BROOKLYN
ROASTING COMPANY



Let's get coding!

Blockchain for coffee scenario, Agile process



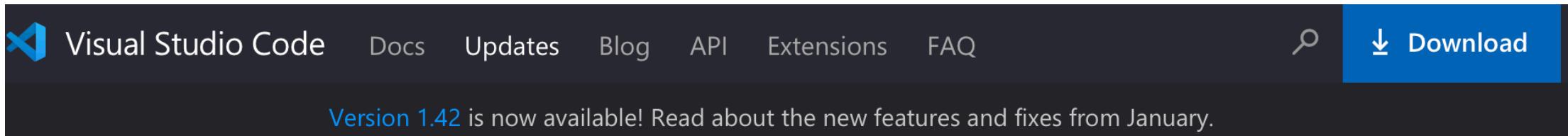
- Two participants: a grower, a roaster
- Later on you'll add on the other participants: the shipper and the coffee shop

Development tools and Installation

The current workshop uses all cloud components, no installation is necessary. After the workshop, you will need to install the following products:

- Visual Studio Code: <https://code.visualstudio.com>
- Followed by the Visual Studio Platform plug-in: <https://bit.ly/2RS2R02>
- An account on the IBM Cloud: <https://www.ibm.com/cloud>
- Followed by the signing up to the IBM Blockchain Platform Service:
<https://ibm.co/398sxeT>

VS Studio Code

A screenshot of the Visual Studio Code website's header. It features a dark blue background with white text. On the left is the Visual Studio Code logo (a blue 'V' icon). To its right is the text "Visual Studio Code" followed by navigation links: "Docs", "Updates", "Blog", "API", "Extensions", and "FAQ". Further to the right is a magnifying glass icon for search, and a blue button with a white downward arrow and the word "Download". Below the header, a dark bar contains the text "Version 1.42 is now available! Read about the new features and fixes from January."

Visual Studio Code Docs Updates Blog API Extensions FAQ

Version 1.42 is now available! Read about the new features and fixes from January.

Download

August 2019 (version 1.38)

https://code.visualstudio.com/updates/v1_38

VSCode Extension

Visual Studio | Marketplace

Visual Studio Code > Programming Languages > IBM Blockchain Platform



IBM Blockchain Platform

IBM Blockchain | 33,782 installs | ★★★★★ (5) | Free

End to end extension for Hyperledger Fabric developers. Develop and test your blockchain smart contracts and client applications on your local machine, and package your projects for deployment into IBM Blockchain Platform runtimes.

[Install](#) [Trouble Installing? ↗](#)

<https://bit.ly/2RS2R02>

VS Studio Code with VS Code extension

The screenshot shows the Visual Studio Code (VS Code) interface with the IBM Blockchain Platform extension installed. The left sidebar contains sections for Smart Contracts (No packages found), Fabric Environments (Local Fabric), Fabric Gateways (No gateways found), and Fabric Wallets (No wallets found). The main workspace title bar includes tabs for 'tled-1', 'Preview RELEASE-NOTES.md', 'Release Notes: 1.38.1', and 'IBM Blockchain Platform Home'. The central area displays the 'IBM Blockchain Platform' welcome screen (v1.0.20) with a 'Welcome' section, a 'Get started' section with a callout arrow pointing to the 'Follow tutorials' link, a 'Help & Support' section, and an 'Explore sample code' section featuring the 'FabCar' sample.

IBM Blockchain Platform Home

IBLOCKCHAIN PLATFORM

SMART CONTRACTS

No packages found

FABRIC ENVIRONMENTS

Local Fabric (click to start)

FABRIC GATEWAYS

No gateways found

FABRIC WALLETS

No wallets found

tled-1

Preview RELEASE-NOTES.md

Release Notes: 1.38.1

IBM Blockchain Platform Home

IBM Blockchain Platform

v1.0.20

Welcome

This extension supports the complete development workflow for Hyperledger Fabric and IBM Blockchain Platform:

- Generate, edit and package smart contracts
- Deploy and debug contracts locally with a simple pre-configured Local Fabric network
- Connect to any Fabric environment for deployment, including the IBM Blockchain Platform service (on IBM Cloud) or software (on-prem & multicloud)
- Submit and evaluate transactions, and develop client applications

Help & Support

Free e-book: Getting Started with Enterprise Blockchain

Read the documentation

Hyperledger Fabric performance reports

Get started

Learn how to develop and debug your smart contracts, and deploy them to your network.

Follow tutorials

Explore sample code

FabCar

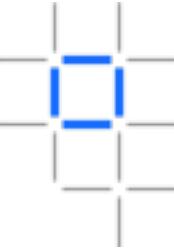
Basic sample based on cars: the "hello world" of Hyperledger Fabric samples.

Commercial Paper

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

Using git 2.21.0 from /usr/local/bin/git

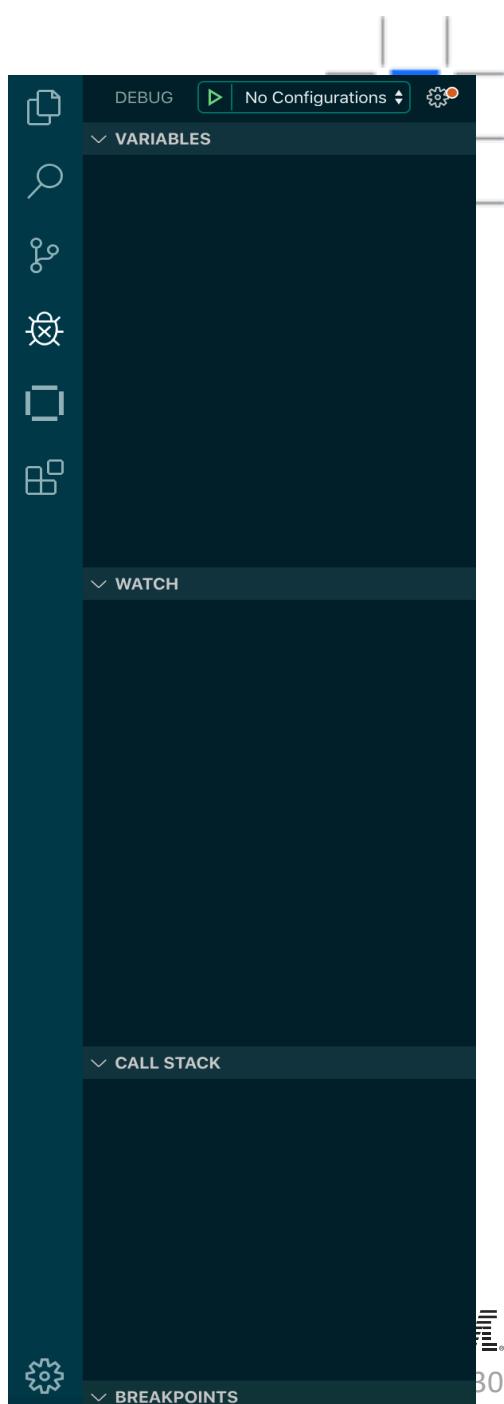
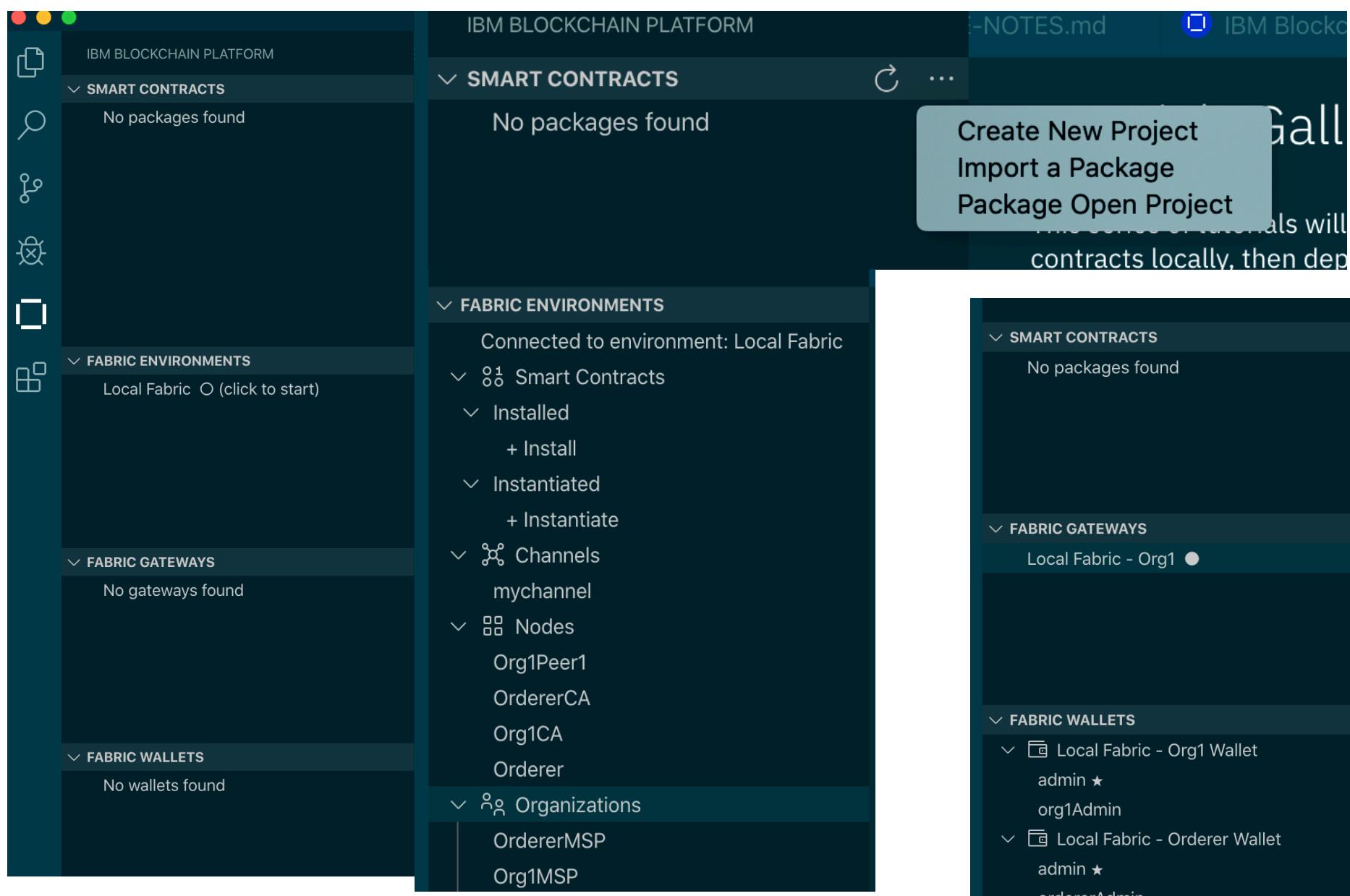
Git



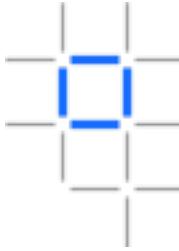
Additional Materials

- IBM Blockchain 101: <https://ibm.co/36U1QZM>
- Blockchain code patterns: <https://ibm.co/2GROsL0>

VSCode Layout



Lab 1

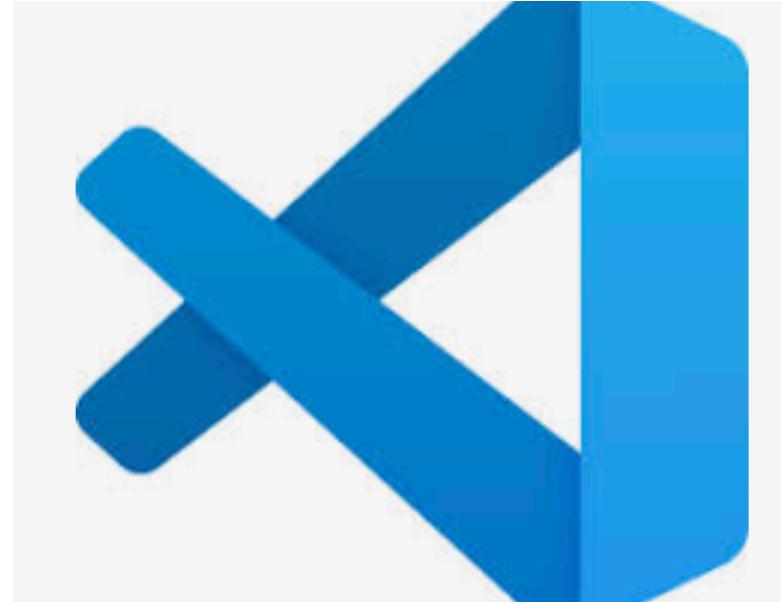


Tutorial 1

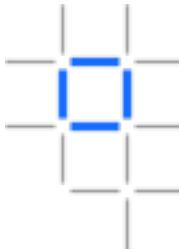
20-30 mins

Local smart contract development

Follow the typical workflow from generating a new smart contract project, deploying code to the Local Fabric runtime, and testing your transactions via an application gateway.



Lab 2

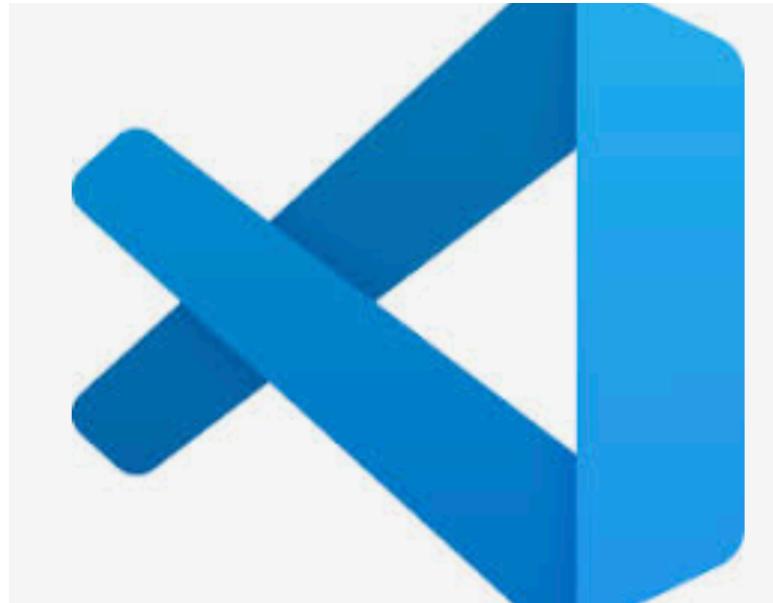


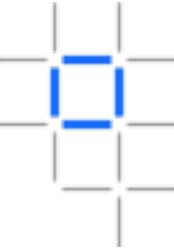
Tutorial 2

50-60 mins

Create a cloud blockchain deployment

Sign up for the IBM Blockchain Platform service on IBM Cloud, and configure a simple environment ready to deploy your smart contracts to.





Lab 3, stretch goal.

Tutorial 3

15-20 mins

Deploying and transacting with IBM Cloud

Export smart contracts from VSCode, deploy them in your environment on IBM Cloud, then send transactions from your local machine by creating a gateway.

Additional labs.

Showing 1 - 12 of 50 results

Sort: Date Newest to ▾



- Blockchain Bean 2:

<https://github.com/IBM/blockchainbean2>

- Blockchain code patterns

<https://developer.ibm.com/patterns/category/blockchain/>



Code Pattern

Secure a digital wallet in the public cloud

January 28, 2020



Code Pattern

Build a digital asset management application using blockchain

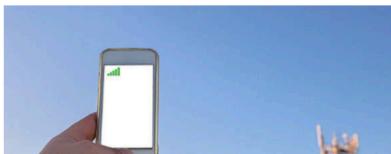
January 20, 2020



Code Pattern

Run a smart contract on a blockchain network with the Raft ordering service

January 8, 2020



Code Pattern

Blockchain for telecom roaming, fraud user identification, and overage management

October 8, 2019



Code Pattern

Use a PostgreSQL database as a Hyperledger Fabric wallet using Fabric Node SDK

September 17, 2019



Code Pattern

Build a network to support blockchain-enabled crowdfunding

September 9, 2019



Code Pattern

Create and deploy a blockchain network using Hyperledger Fabric SDK for Java

August 16, 2019



Code Pattern

Build a blockchain network for trusted IoT

August 1, 2019



Code Pattern

Build a global finance application on blockchain

July 31, 2019



Code Pattern

Use CI/CD to deploy a chaincode to blockchain in private cloud on LinuxONE

July 16, 2019



Code Pattern

Build a secure e-voting app

July 10, 2019



Code Pattern

Use a Kubernetes cluster to deploy a Fabric network smart contract onto blockchain

June 17, 2019



Thank you

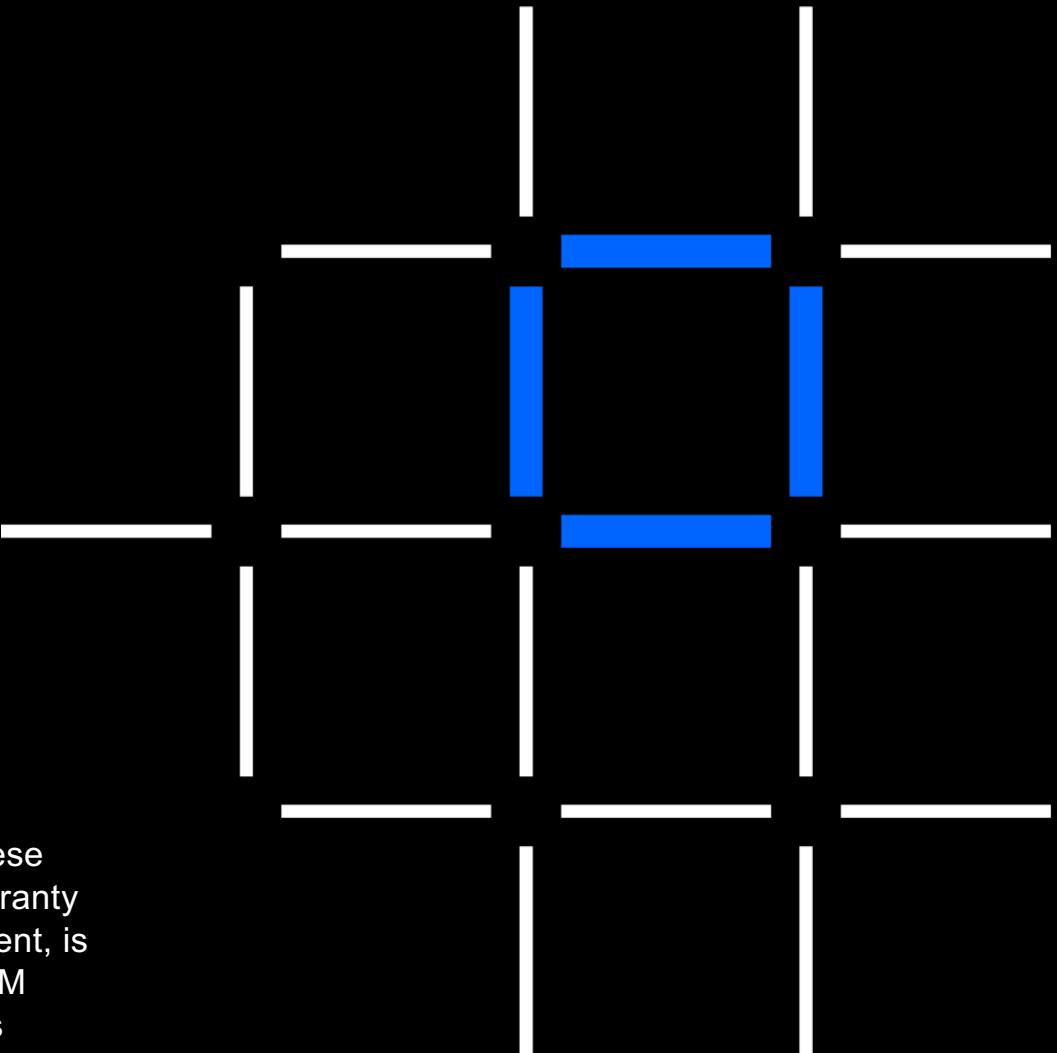
*Lennart Frantzell
Grant Steinfeld*

IBM Blockchain

www.ibm.com/blockchain

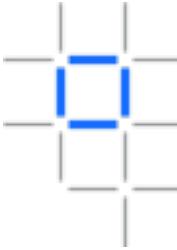
developer.ibm.com/blockchain

www.hyperledger.org



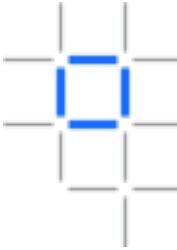
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IBM



Housekeeping

- VCPI link SF: <https://ibm.biz/BdqDWA>
 - Whitelisting: <https://cloud.ibm.com/registration/whitelist>
 - IBM Careers: <https://careers.ibm.com>
 - IBM Partner world: <https://www.ibm.com/partnerworld/public>
 - Sign up to the IBM Cloud: <https://ibm.biz/BdqDWA>
-
- https://cloud.ibm.com/registration?cm_mmc>Email_Events_-_Developer_Innovation_-_WW_WW_-_advocates:alf,max-katz\title:howtoreateasupplychainblockchainapp\eventid:5e2f89bbb1889fcaca174d52\date:Feb2020\type:workshop\team:global-devadvgrp-sanfrancisco\city:santaclaral\country:unitedstates\tags:blockchain\contents:blockchain-disaster-management-solution&cm_mmca1=000019RS&cm_mmca2=10004805&cm_mmca3=M99938765&eventid=5e2f89bbb1889fcaca174d52&cvo_src=email.Events.M99938765&cvo_campaign=000019RS



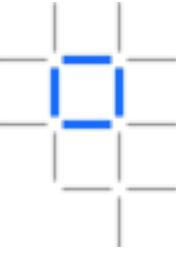
Whitelisting

Whitelisting: <https://cloud.ibm.com/registration/whitelist>

If you are whitelisting a VCPI code, please only enter everything after cm_mmc= until the first &.

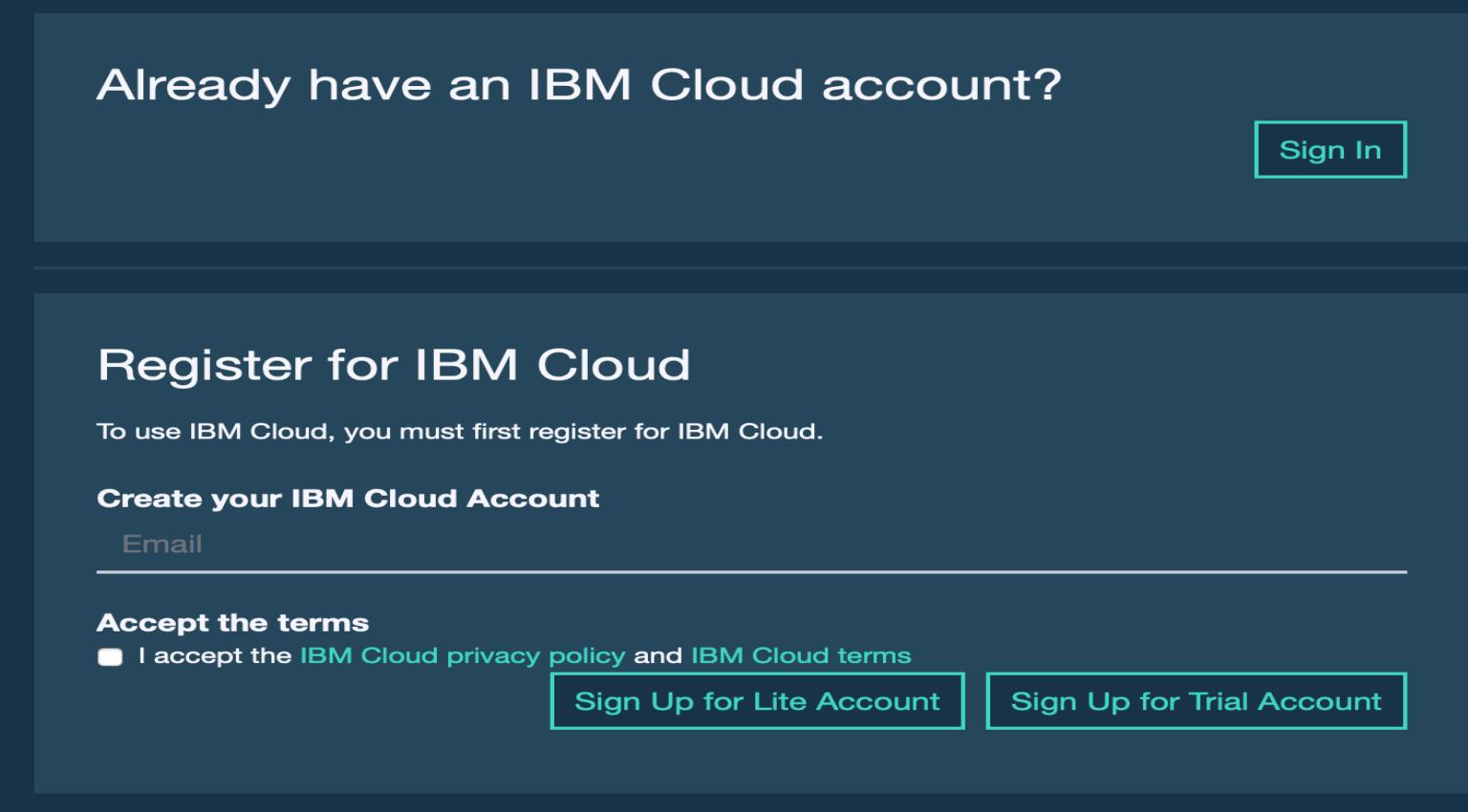
Email_Events_-Developer_Innovation_-WW_WW_-
advocates:alf,max-katz\title:howtoreateasupplychainblockchainapp\eventid:5e2f89bbb18
89fcaca174d52\date:Feb2020\type:workshop\team:global-devadvgrp-
sanfrancisco\city:santaclara\country:unitedstates\tags:blockchain\conte
nts:blockchain-disaster-management-solution

Event format



- Two hour workshop on 2/24 NYC and 2/27 SF
- Intro, presentation 30 minutes
- Workshop 1 hour using new IBM OpenLabs environment
- Wrapup 30 minutes

Sign-up for IBM OpenLabs account



The screenshot shows the sign-up process for an IBM OpenLabs account. It begins with a question "Already have an IBM Cloud account?" followed by a "Sign In" button. Below this, there's a section titled "Register for IBM Cloud" with the sub-instruction "To use IBM Cloud, you must first register for IBM Cloud." A "Create your IBM Cloud Account" button is present. A form field for "Email" is shown with a placeholder "Email". An "Accept the terms" section includes a checked checkbox next to the text "I accept the IBM Cloud privacy policy and IBM Cloud terms". At the bottom, two buttons are available: "Sign Up for Lite Account" and "Sign Up for Trial Account".

Already have an IBM Cloud account?

Sign In

Register for IBM Cloud

To use IBM Cloud, you must first register for IBM Cloud.

Create your IBM Cloud Account

Email

Accept the terms

I accept the [IBM Cloud privacy policy](#) and [IBM Cloud terms](#)

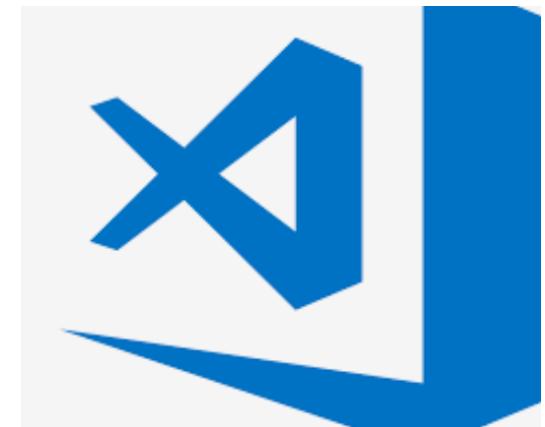
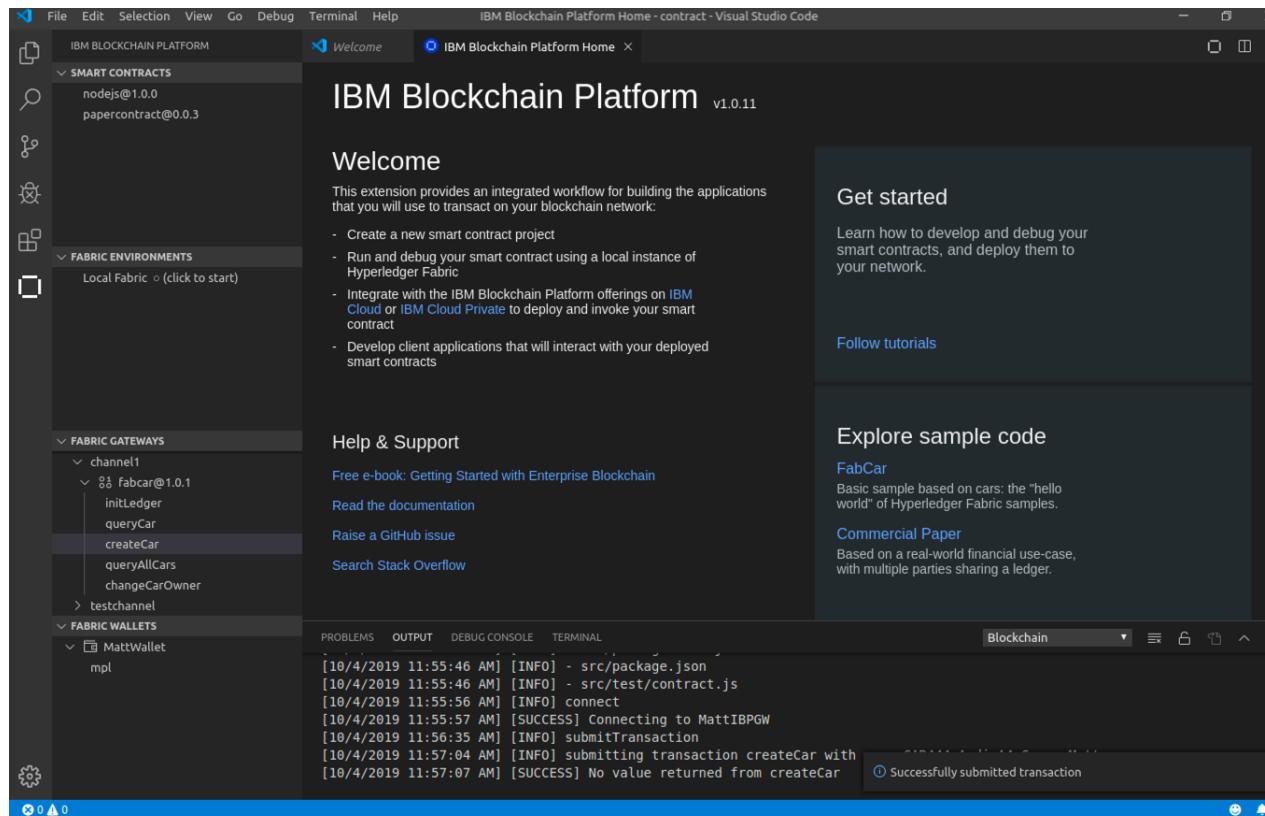
[Sign Up for Lite Account](#)

[Sign Up for Trial Account](#)

- <https://developer.ibm.com/openlabs/event/IBP-EVENT-DEMO>

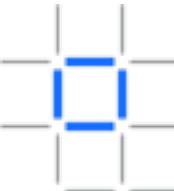
Getting Started with Hyperledger Fabric

- The IBM Blockchain Platform makes it easy to get started with Hyperledger Fabric
- [Download VSCode developer](#) tool from VSCode marketplace. Linux, Windows and MacOS)
- Create local networks, smart contracts and applications. Move to multi-cloud when you're ready!



<https://marketplace.visualstudio.com/items?itemName=IBMBlockchain.ibm-blockchain-platform>

IBM Blockchain Platform Admin Console



- Multi-cloud administration tool
 - Web UI to manage all IBP components
- Configure infrastructure on IBM Cloud
 - Configure IKS network, storage, compute
- Connect & Manage components
 - Peer, Orderer, CA, channel...
- Policy & Identity management
 - Create, update, display channel policies
- Smart contract package management
 - Install, instantiate, upgrade, discover

The screenshot shows the Admin Console interface for IBM Blockchain Platform Free 2.0 (Beta). It features a dark theme with blue highlights for interactive elements. On the left is a sidebar with icons for Nodes, Peers, Certificate Authorities, Orderers, and Smart Contracts. The main area has tabs for Nodes, Peers, Certificate Authorities, Orderers, and Smart Contracts. Each tab displays a list of components with their names, types, and deployment details. A prominent blue button labeled '+ Add' is visible in several sections, indicating where new components can be added.

IBM Blockchain Platform Free 2.0 (Beta)

Welcome to the IBM Blockchain Platform console

You are able to monitor your Blockchain components across all deployments. Start by adding a certificate authority or other network component.

Learn more in our documentation Do not show again

Add Certificate Authority Add peer Build a Smart Contract

Nodes

Peers ⓘ

EU-London-Test Peer PeerOrg1 IBM Cloud Private	EAP-Prod Peer PeerOrg1 IBM Cloud Private	EU-London-Prod Peer PeerOrg1 IBM Cloud Private	US-Dallas-Prod Peer PeerOrg1 IBM Cloud Private	US-Dallas-Test Peer PeerOrg1 Amazon Web Services	Add peer +
---	---	---	---	---	------------

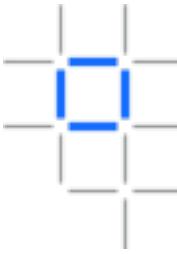
Certificate Authorities ⓘ

US-AuthSign Certificate Authority IBM Cloud Private	EU-AuthSign Certificate Authority IBM Cloud Private	Add Certificate Authority +
---	---	-----------------------------

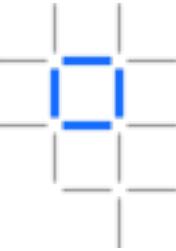
Orderers ⓘ

TMPF-Network Orderer	EurBankNet Orderer	Add orderer +
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Blockchain Videos



- <https://developer.ibm.com/technologies/blockchain/videos/>



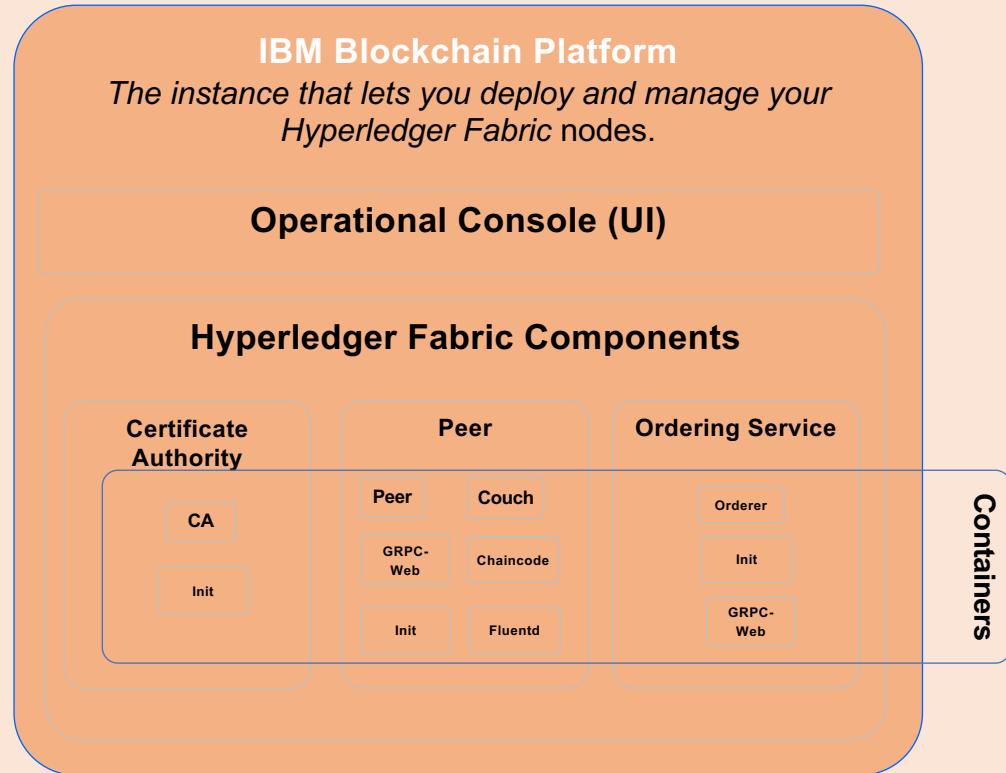
On IBM Cloud, your blockchain components are deployed to an IBM Kubernetes service

The screenshot shows the IBM Blockchain Platform Catalog interface. On the left, there's a sidebar with 'All Categories' and several service links: VPC Infrastructure, Compute, Containers (which is highlighted with a blue border), Networking, Storage, AI, Analytics, Databases, and Developer Tools. The main area is titled 'Containers' and features a card for 'Kubernetes Cluster' by IBM. The card description reads: 'Deploy native Kubernetes clusters with the latest upstream versions on hardened master and worker nodes.' Below the card, there's a link to 'APIs and services'. At the bottom of the catalog page, there's a snippet of another card, showing a purple icon and the word 'Blockchain'.

- Blockchain resources are deployed into your own Kubernetes cluster
- This allows you to maintain control over your resources (CPU, storage, memory)
- Scale up or down as required for your blockchain environment
- Start small, pay as you grow for what you use with no upfront investment
- Maintain control of private keys

Deployment Overview: IBP & IKS & Storage

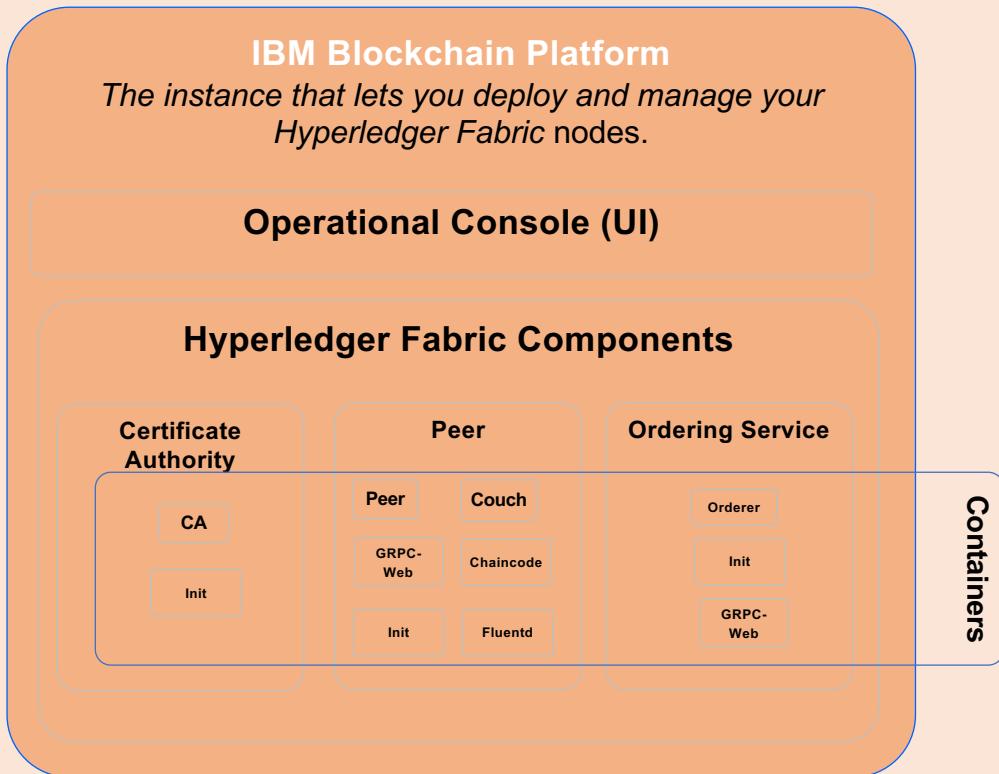
Your Blockchain Service



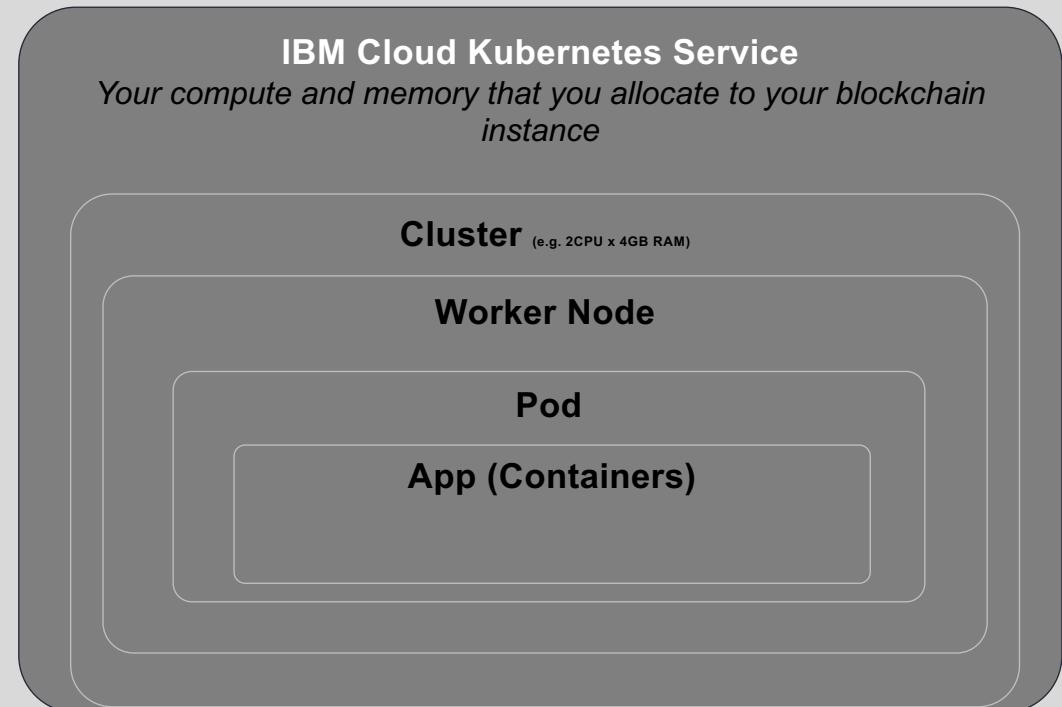
Your Infrastructure Resources

Deployment Overview: IBP & IKS & Storage

Your Blockchain Service

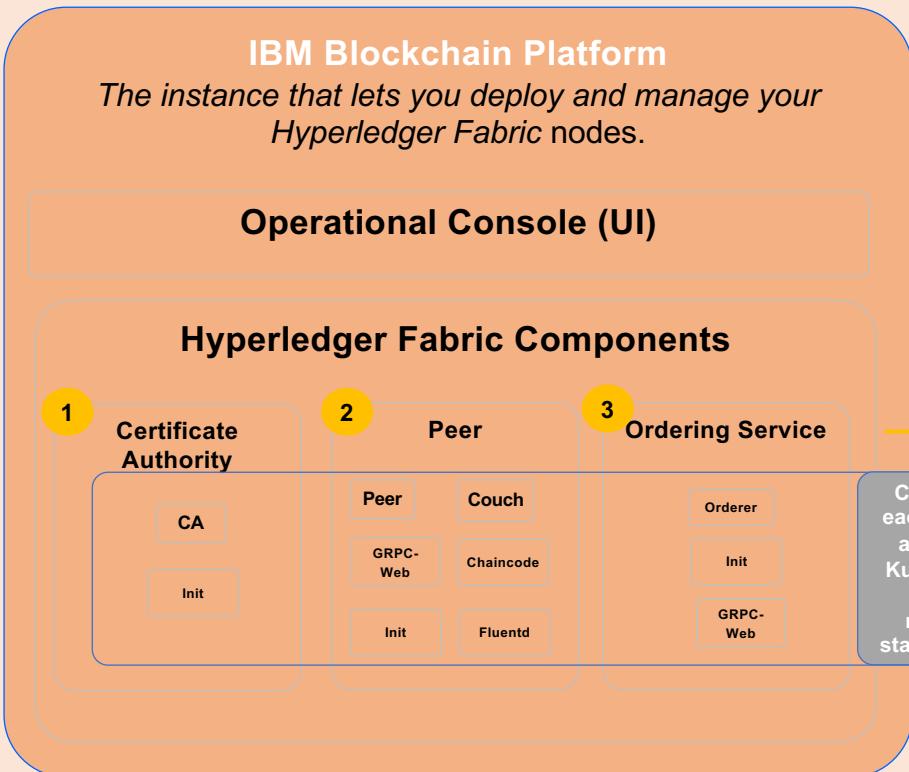


Your Infrastructure Resources

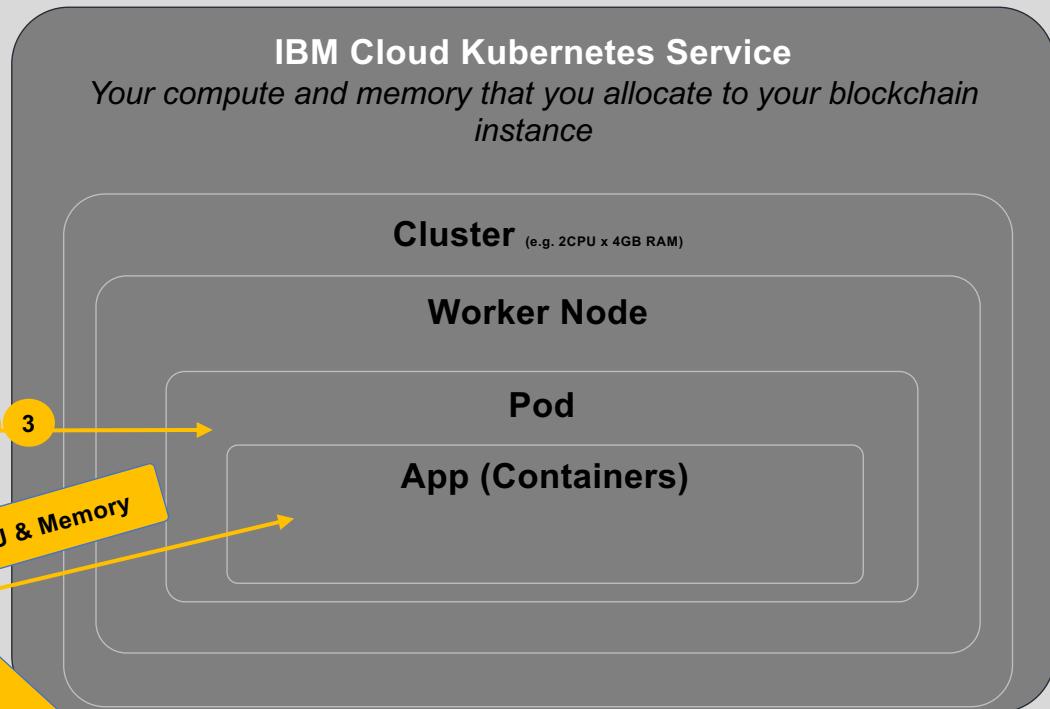


Deployment Overview: IBM & IKS & Storage

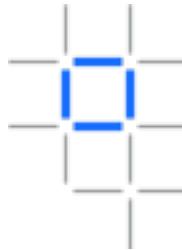
Your Blockchain Service



Your Infrastructure Resources



Summary



- The **Hyperledger Fabric** transaction
 - Structure drives system design and application architecture
 - **Smart contract**
 - Contains transaction definitions for entire lifecycle of business object(s) stored in a decentralized ledger
 - built-in contract class makes programming easy
 - **Application**
 - Consensus is complex, but the SDK makes it easy for applications
 - submitTransaction(), evaluateTransaction(), addListener()
 - gateway connectionOptions for ultimate customizability
 - The **IBM Blockchain Platform** difference
 - Multi-cloud networks, developer & operator tools, IBM service and support

```
        String} issuedAt,
        String} maturityDate,
        Integer} faceValue faceValue

    sync issue(ctx, issuer, paperNumber,
        // create an instance of the paper
        let paper = CommercialPaper.createI

        // Smart contract, rather than paper
        paper.setIssued();

        // Newly issued paper is owned by
        paper.setOwner(issuer);

        // Add the paper to the ledger
        ledger.add(paper);
    }
}
```

IBM