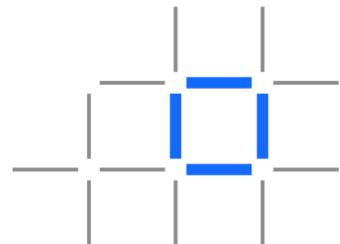


# Workshop Agenda – Day 2

- IBM Blockchain Platform Explained, demo
- Hyperledger Fabric Installation Overview
- LAB: Hyperledger Fabric Installation & Verification
- LUNCH
- LAB: Marbles Smart Contract and UI
- Hyperledger Explorer Overview
- LAB: Hyperledger Explorer Installation & Usage
- Blockchain Integrated
- Next Steps



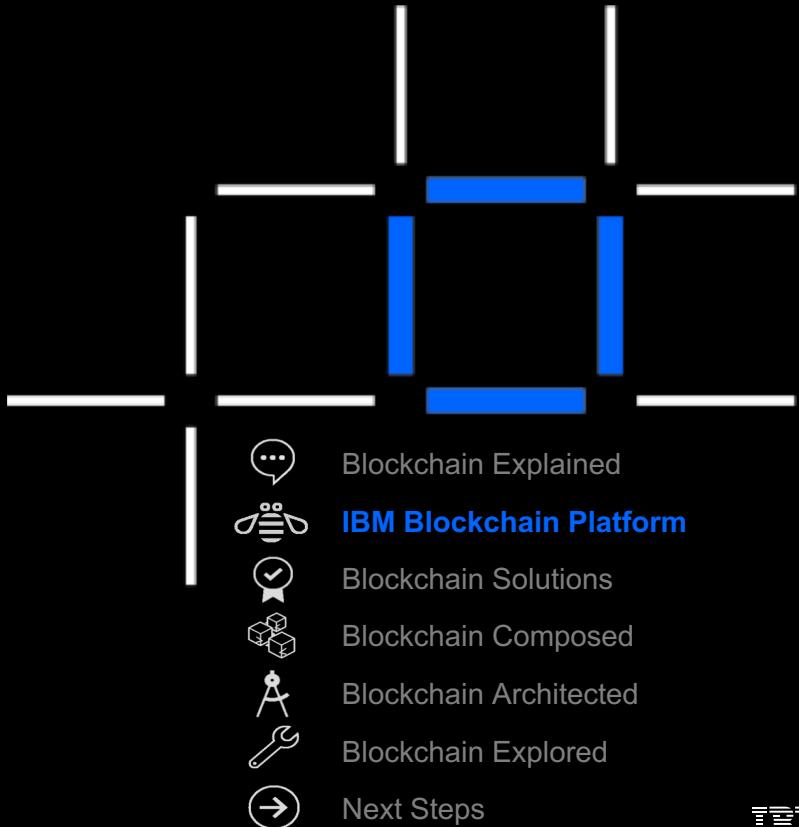
# IBM Blockchain Platform Explained

## An Introduction to IBM Blockchain Platform

Jin VanStee

*Blockchain and Transformation Leader*

*NA Z Tech Sales*





## IBM Blockchain Platform Overview

*What you need to know*



## Getting Started

*The tools to make your blockchain real*



## Roadmap

*IBM's blockchain strategy and where the platform is going*



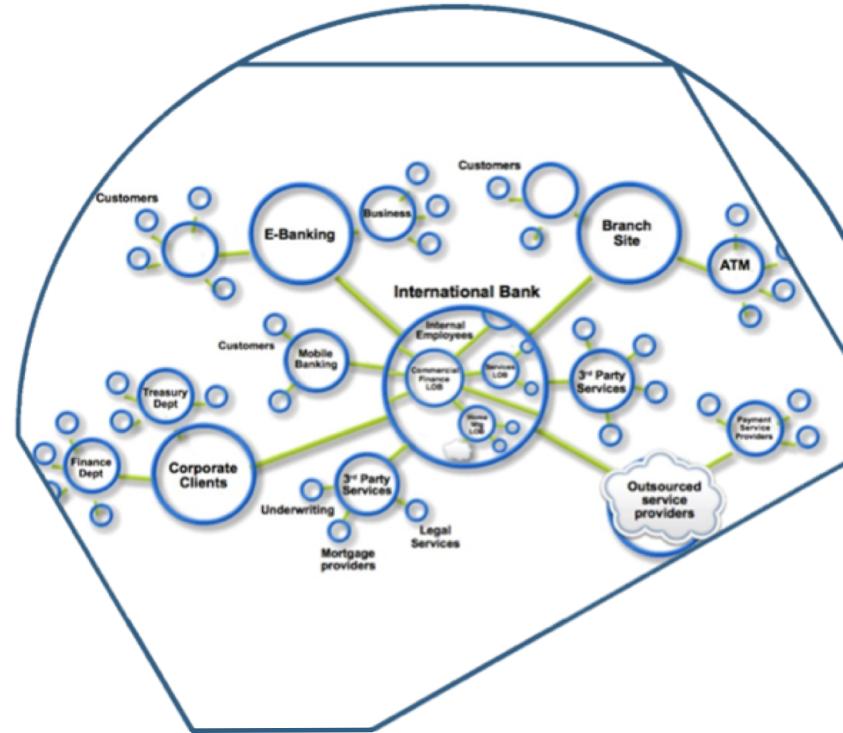
## Technical Details

*The architecture behind IBM Blockchain Platform*

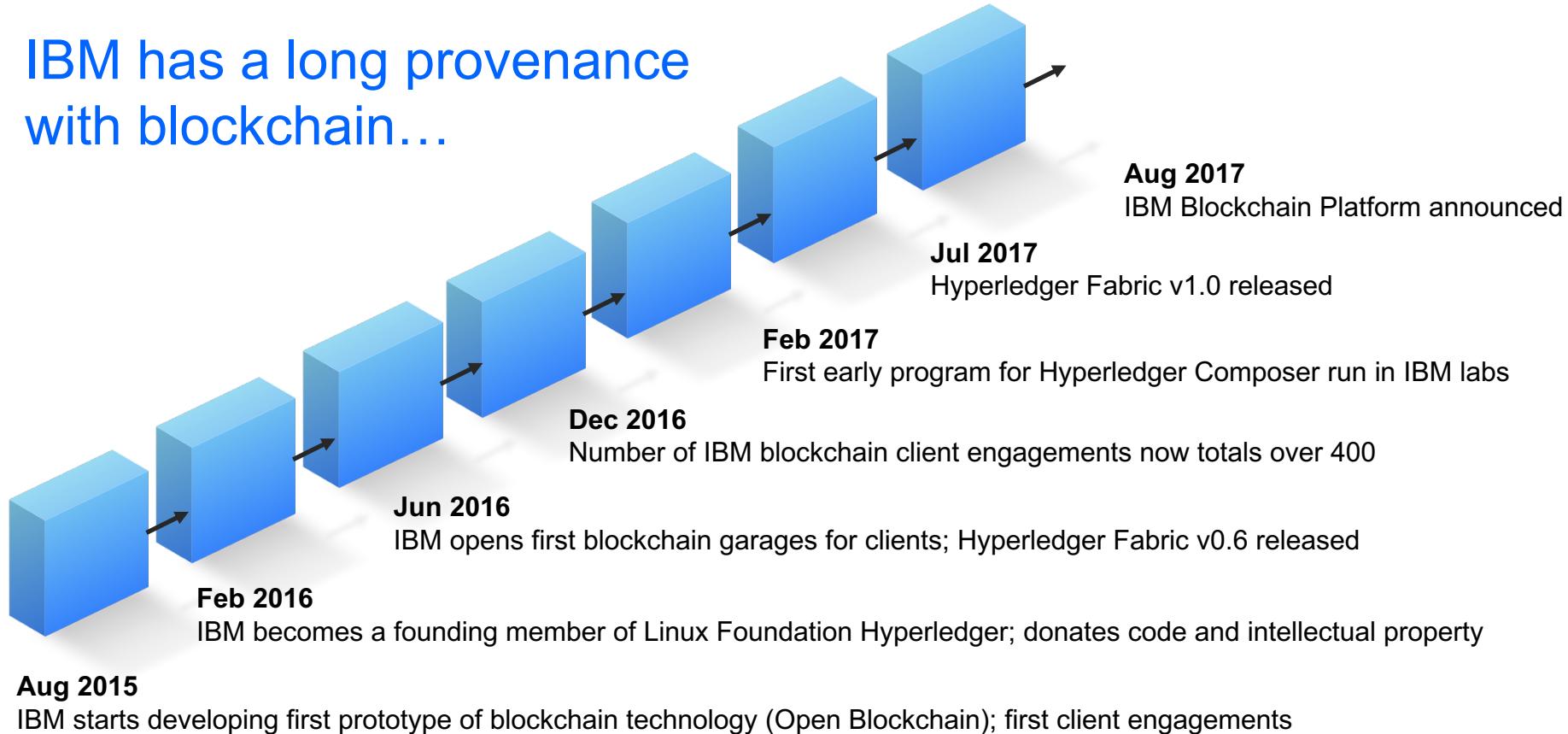


# Blockchain Recap

- 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 and consensus
  - Hyperledger Composer is a suite of tools that make it easy to develop blockchain applications



# IBM has a long provenance with blockchain...

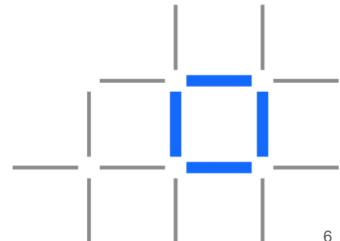
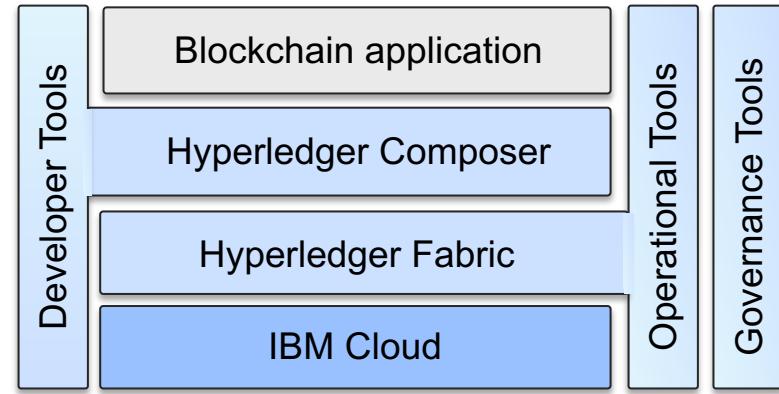


# Introducing the IBM Blockchain Platform

[http://ibm.biz/Platform\\_Demo](http://ibm.biz/Platform_Demo)

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

- **Developer tools** that make use of Hyperledger Composer 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 a highly secure and performant **IBM Cloud** environment



# 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 Composer toolset

## 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

# Platform Value: *Simplicity in the face of overwhelming complexity*

	IBM Blockchain Platform	Community Code Deployment
Inviting members	5 seconds	20 minutes per instance
Installing and instantiating smart contracts	Single click installation	10 minutes per smart contract per peer
Deployment	Specify network parameters and automatically launch ordering service	Not available
Network alterations and additions	Add new members, channels and smart contracts through single clicks, text box or drop down via the UI	CLI driven, and more advanced skills required
Support	Complete support from the HW stack through the blockchain code base included	Not available
Security	Secure container and highest level of security provided	Custom
Migration	Rolling migration and 99.999% availability provided under the covers	Not available

*"IBM provides us with the easiest way to develop prototype blockchain applications for our clients. Thank you!"*

-- Global consulting firm

*"IBM has enabled our team to develop our blockchain demo with minimal hassle and gives us a clear path to scale with the tools to manage it"*

-- Series backed start-up

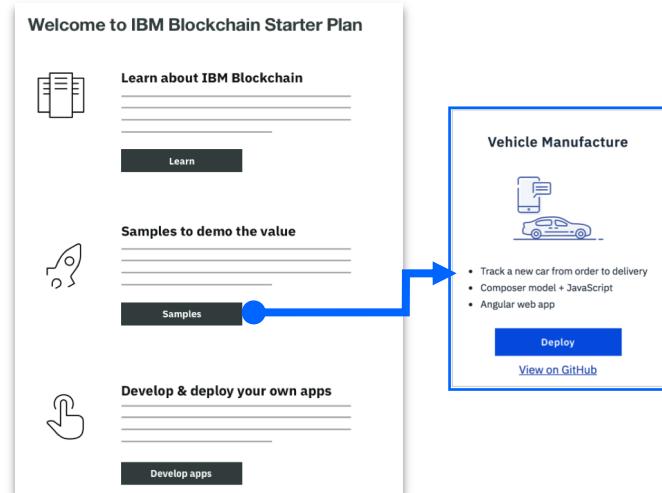
# Flexible plans

Plan	Key Features	Deployment
Starter	Easy on-ramp for blockchain-as-a-service	IBM Cloud
Enterprise	Production plan for industries comfortable with cloud	IBM Cloud
Enterprise +	Production plan for regulated industries, multi-region HA/DR and highest performance	IBM Cloud
Support-only	Supported instances of Hyperledger Fabric and Composer running outside IBM Cloud Platform	Docker

# Starter Plan

Sign up at  
[www.ibm.com/blockchain](http://www.ibm.com/blockchain)

- Get started with IBM Blockchain Platform with **one-click setup and a fully functional network**
  - Configured for two organizations with one peer each, sample applications and informational tutorials
  - Environment enables iterative development prior to production deployment
  - Same experience as Enterprise
    - Uses SOLO ordering for simplified configuration, development and testing
- Currently in beta, and free until generally available
  - After that time, sign up for 30 day free trial
  - Expected charge: **\$500 per month**
    - Assumes a two organization network
    - Total membership fee \$250, plus per-peer cost of \$125



# Enterprise Plan

- Enterprise Plan is intended for **production or near-production** scenarios
  - Everything in Starter, plus everything you need for a full production environment
  - HSM availability, fault tolerant ordering service, added layers of securing and premium support
  - 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



# Enterprise+ Plan

- Enterprise+ Plan is also intended for **production or near-production** scenarios
  - Everything in Enterprise, plus multi-zone HA/DR and complete data isolation
  - Virtual circuits: VPN access from your data center
- Currently limited availability
  - Contact IBM for pricing information



IBM Blockchain Platform Membership Plans	Starter	Enterprise	Enterprise Plus
Suitability	MVP		
Features			
Deploy and run Composer apps			
Hyperledger Fabric features and capabilities			
Multiple org simulation			
Rolling migrations with no network outages			
Low-code interface			
Ability to scale			
Support options			
Fault tolerant ordering service			
Cryptographic Acceleration			
HSM Available		Coming soon	Coming soon
Advanced Secure container technology			
Isolated Compute Environment			
Multi-Geo/Site DR			

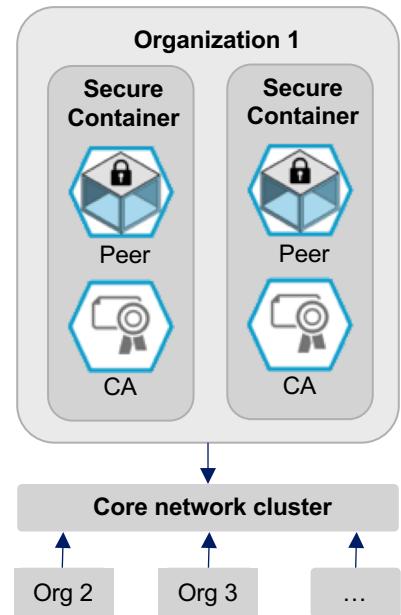
# Support-only Plans

- Looking for **IBM support on Hyperledger Fabric or Composer?**
  - IBM produces signed Hyperledger Fabric images which can be supported for production usage outside of IBM Cloud
  - Hyperledger Composer supported within same plan
  - 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



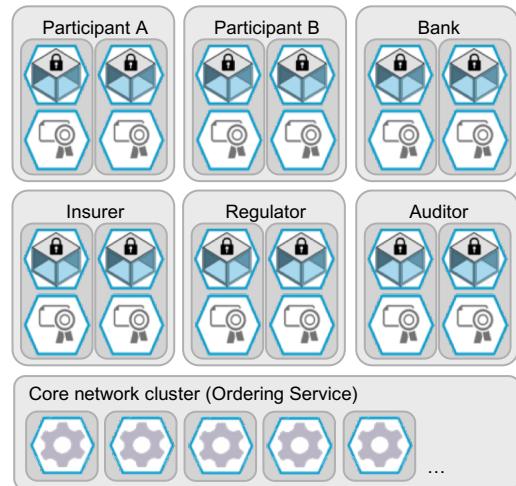
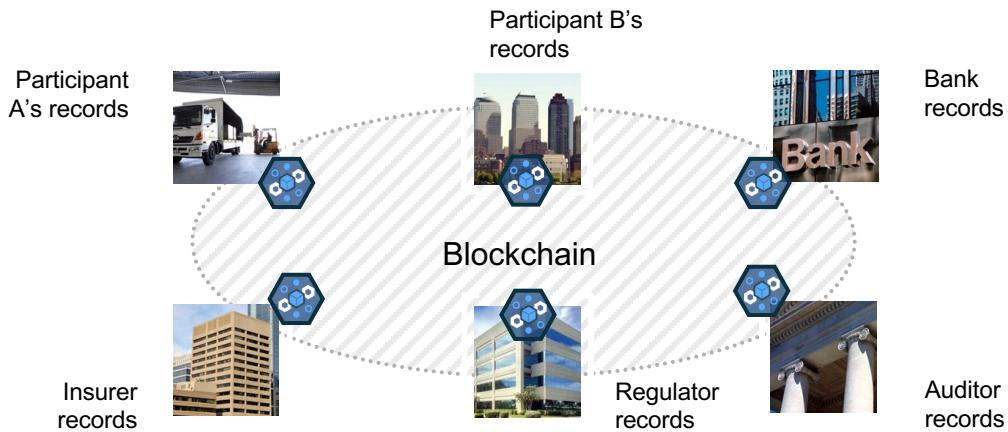
# Platform Configuration

- Development environment
  - Try online, install locally or use Starter Edition
- Isolated peer clusters: one per organization
  - **Two active peers and two certificate authorities** per organization recommended (for high availability)
  - Each member provisions resources inside their IBM Cloud environment
- Core network cluster (for consensus)
  - Sits at the network level and is administered democratically by members in an administration group
  - Changes to the network occur democratically according to defined governance policies
  - Uses Kafka-based ordering service, providing crash fault tolerance

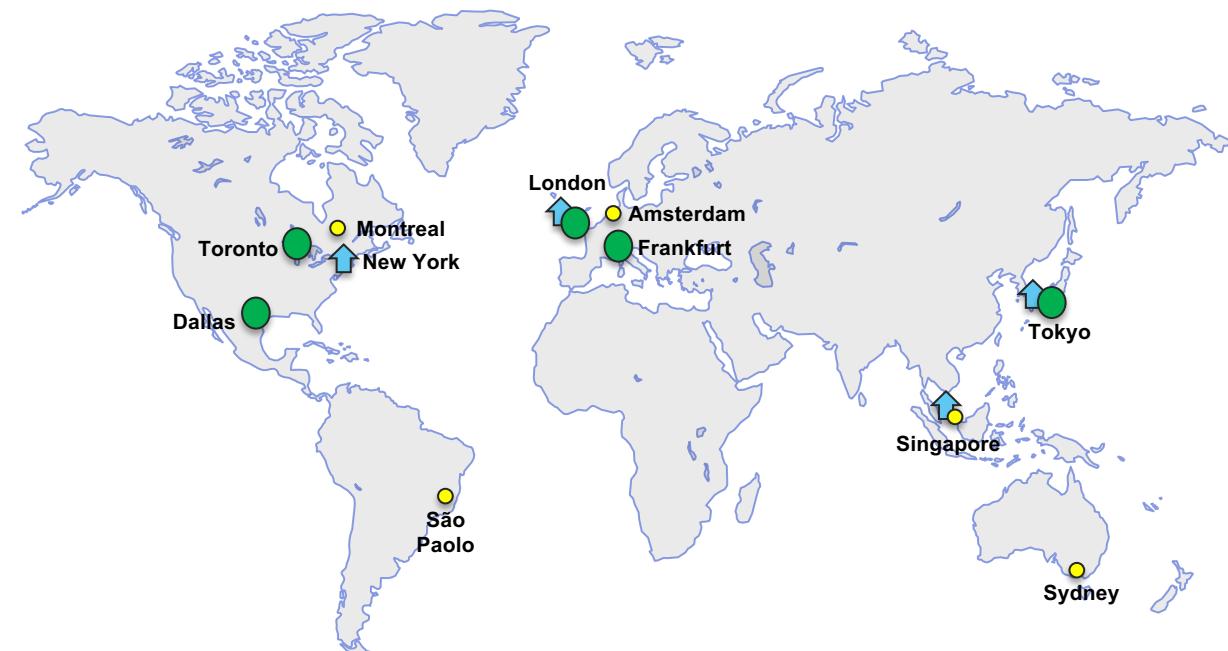


# Example Network

- Consider an in-production blockchain business network comprising multiple organizations running Enterprise Plan on IBM Cloud
  - Each organization has two peers and two certificate authorities
  - Blockchain cost per organization (two peers + membership fee) = US\$3000 per month
  - Support for IBM Cloud services @10% = US\$300
  - Cost for one year per organization =  $12 \times \text{US\$3300} = \text{US\$39600}$



# IBM Blockchain Platform Sites



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

- More platform locations planned

- ↑ Complemented by a set of IBM Blockchain Garages to help you get started with IBM Blockchain Platform

Learn more at  
[www.ibm.com/blockchain](http://www.ibm.com/blockchain)

# IBM can help you make your blockchain a success

The collage consists of three images:

- Top Left:** A whiteboard titled "#1 USE CASE IDEAS" listing various blockchain applications. Ideas include: get right business model, innovative, potential for bank, shared KYC / ID token, simplify onboarding, write existing asset met with Blockchain DB, information exchange with Gov., signed document handling, digital vault provision, loyalty programs, and mutual investment club - trading bank - strategy & cash flow.
- Middle:** Two people working on a wall covered with sticky notes during a workshop.
- Bottom Left:** A "Business Value Assessment" document. It includes sections for Problem (90% of goods in global trade are carried by the ocean shipping industry each year), Solution (Manage and track the paper trail of tens of millions of shipping containers across the world by digitizing the supply chain process), Participants (Supplier, couriers (\*2), customs (\*2), ports (\*2), shippers and retailers), Asset & Trust (Need for trust around paperwork associated with a container), and Transactions (Supplier prepares to ship, release container to courier, load to ship, clear customs, retailer receipt). A table below tracks KPIs like New revenue, Improve client experience, and Reduce transport costs across Baseline, Phase 1, Phase 2-3, and Blockchain Design Points phases.

- Every business network is different!
- IBM can help you with all stages of your blockchain network, for example:
  - Hands-on workshops
  - Blockchain Value Design
  - First Projects
  - Architectural Review
  - Services and Support
- Make use of the expertise located in the Blockchain Garages and in other locations worldwide



## IBM Blockchain Platform Overview

*What you need to know*



### Getting Started

*The tools to make your blockchain real*



### Roadmap

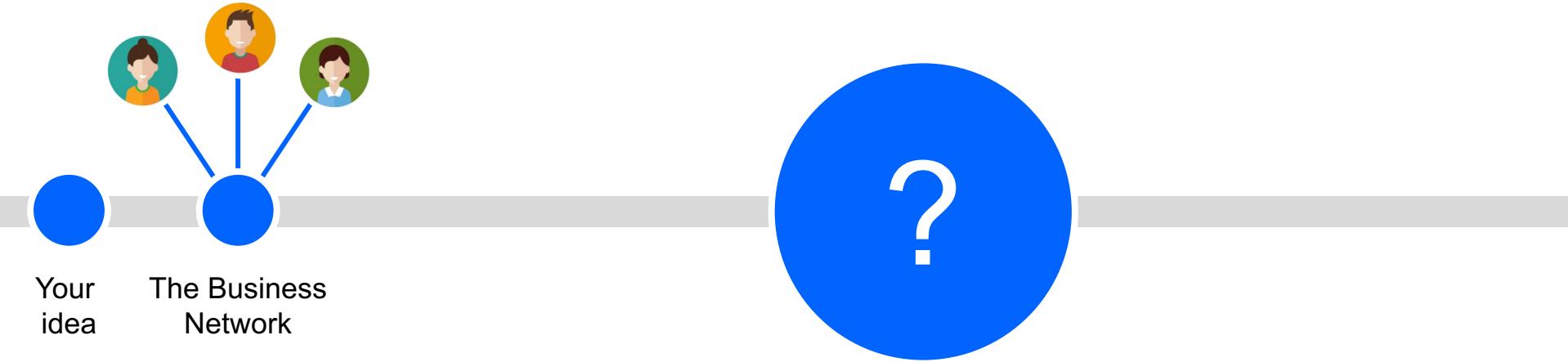
*IBM's blockchain strategy and where the platform is going*



### Technical Details

*The architecture behind IBM Blockchain Platform*





Web energy-network

Define Test

admin

▼

## FILES

## About

README.md

## Model File

models/energy-model.cto

## Script File

lib/business-logic.js

## Access Control

permissions.acl

+ Add a file...

Model, Build  
and Code33  
34 };

## Script File lib/business-logic.js



```
16  * Records the energy usage reading for a given household
17  * @param {com.energy.RecordEnergyReadingTX} tx the energy transaction instance
18  * @transaction
19  */
20  function recordEnergyReading(tx) {
21
22      // Get the asset registry for the energy readings.
23      return getAssetRegistry('com.energy.EnergyReading')
24          .then(function (assetRegistry) {
25              // Put the energy reading in the asset registry
26              return assetRegistry.add(tx.energyReading);
27          })
28          .then(function () {
29              // Emit an event when the ledger is updated
30              var event = getFactory().newEvent('com.energy', 'NewReadingEvent');
31              event.energyReading = tx.energyReading;
32              emit(event);
33
34      });
35  }
```



Your idea

The Business Network

Develop

[Overview](#)[Members](#)[Channels](#)[Notifications](#)[APIs](#)[MY CODE](#)[Write code](#)[Install code](#)[Try samples](#)

## Lets get started!

Choose an option to begin your blockchain journey.



### Learn about the platform

Read tutorials and break down blockchain terminology to build your knowledge.

[Learn more](#)

### Deploy sample apps

Explore sample applications and learn how blockchain code is running on the platform.



### Get started with tips

[View samples](#)

### Start deploy your app

Install the developer tools, use them to create your own apps, and then deploy them to the platform.

[Develop apps](#)[X](#)[Connection Profile](#)[+ Add Peers](#)

### ACTIONS



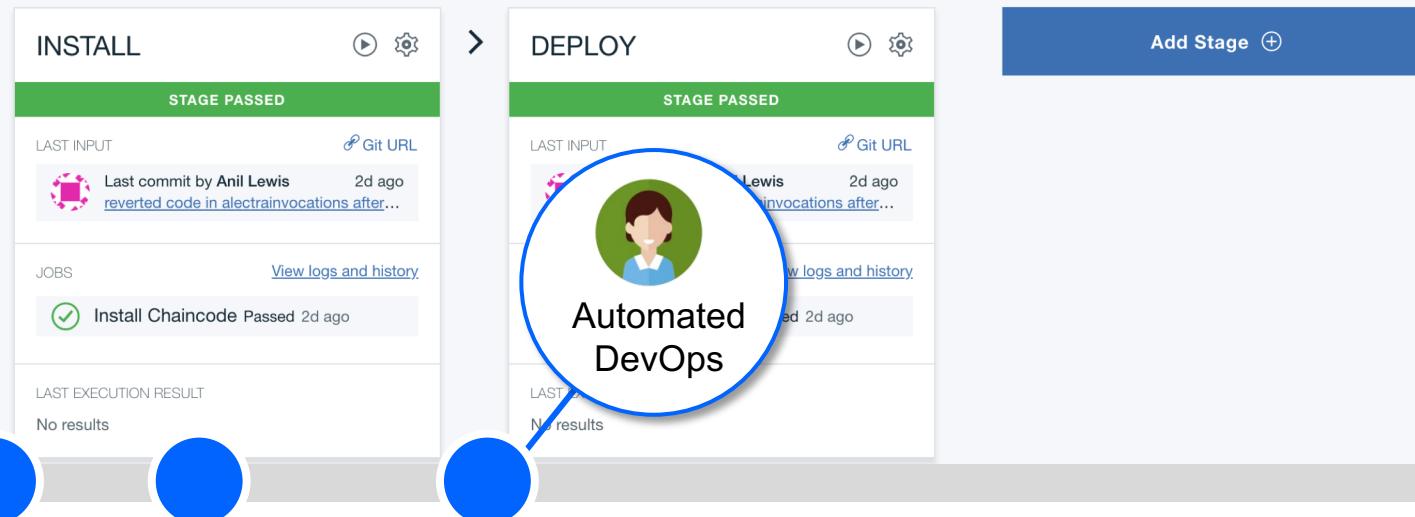
Your  
idea

The Business  
Network

# Develop

Toolchains / energy-bc-toolchain... / energy-bc-chaincode-build-20180306150859885

## energy-bc-chaincode-build-20180306150859885 | Delivery Pipeline



Your idea

The Business Network

Develop

TLS networks LTD. ▾

MY NETWORK

Overview

Members

Channels

Notifications

APIs

MY CODE

Write code

Install code

Try samples



Your idea

The Business Network

Develop

Govern

# Members

View and manage  
the organizations  
that you own by

Members

MEMBERS (1)

Company A  
mdgallo@usCompany B  
mdgallo@usKayla  
kdwhite@usKayla  
kdwhite@usRick  
rlarose@us.i

## Invite member



Organizations in addition to the two organizations  
you're currently managing.

### Select a member for your network

#### Invite a member

Invite other organizations to join your network. Invited members will receive an email invitation with instructions to join your network and set up their own peers.

#### Add a member

Add a new organization to simulate multi-organization scenarios on your own. You can switch between your organizations to operate the network in the Network Monitor.

Organization Name

Enter (member)



## Add new members

Operator Email

Enter email

Add a note

Write a message to

### Invite Members

#### ACTION

ed

ed

ed

ding

ding

# Request a new channel

Complete the steps to request a new channel. After the request is submitted, the invited members will be notified and vote for the request.

## 03. Review channel update policy

Define the policy to update the channel.

### Policy

How many operators need to accept the request to update the channel?

Company	Email
Company A	kdwhite@us.ibm.com
Company B	kdwhite@us.ibm.com
Kayla Co	kdwhite@us.ibm.com

Select ▾

- 1 (Any)
- 2 (Majority)

Cancel Back Submit Request



Your idea

The Business Network

Develop

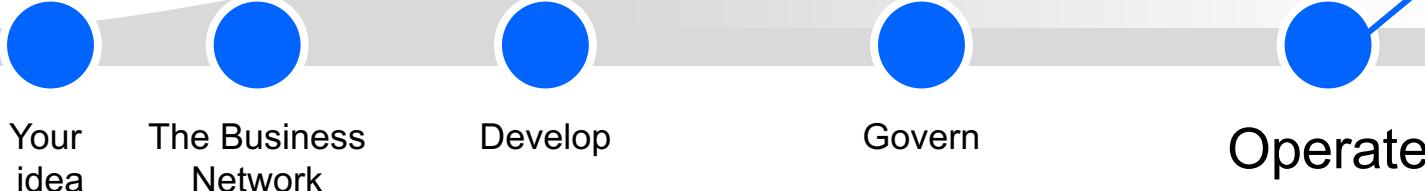
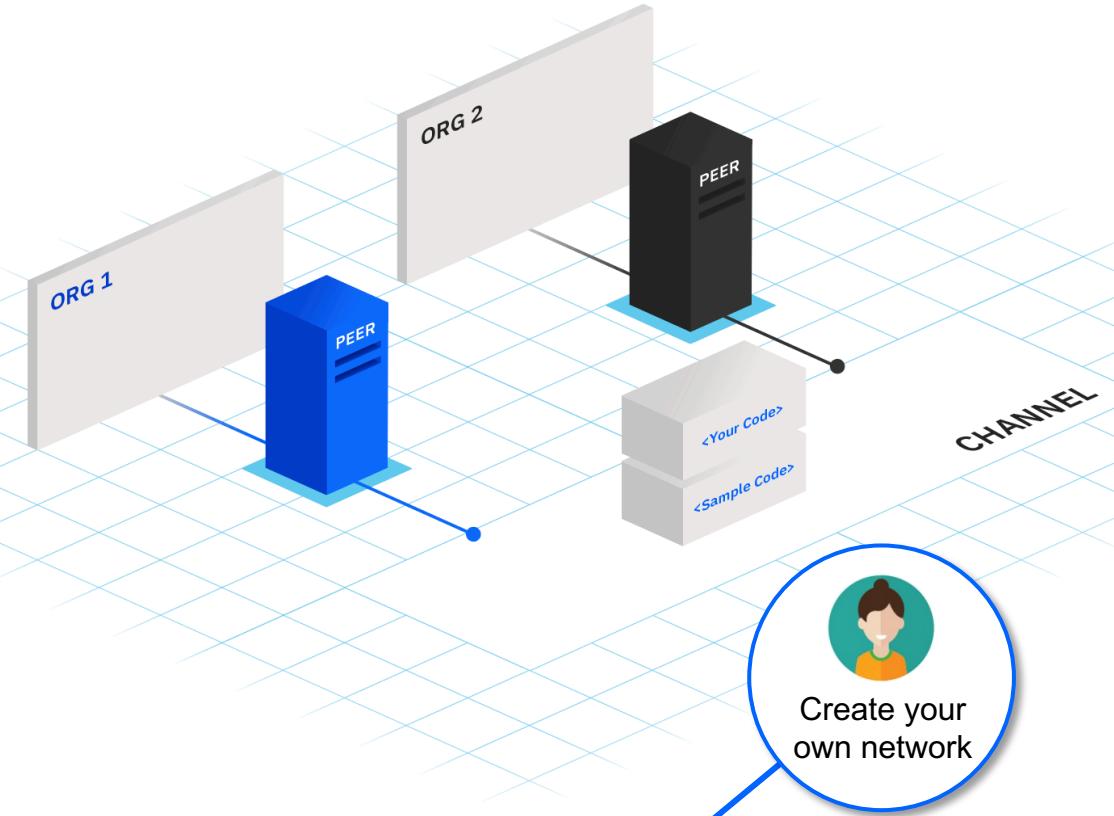
Govern

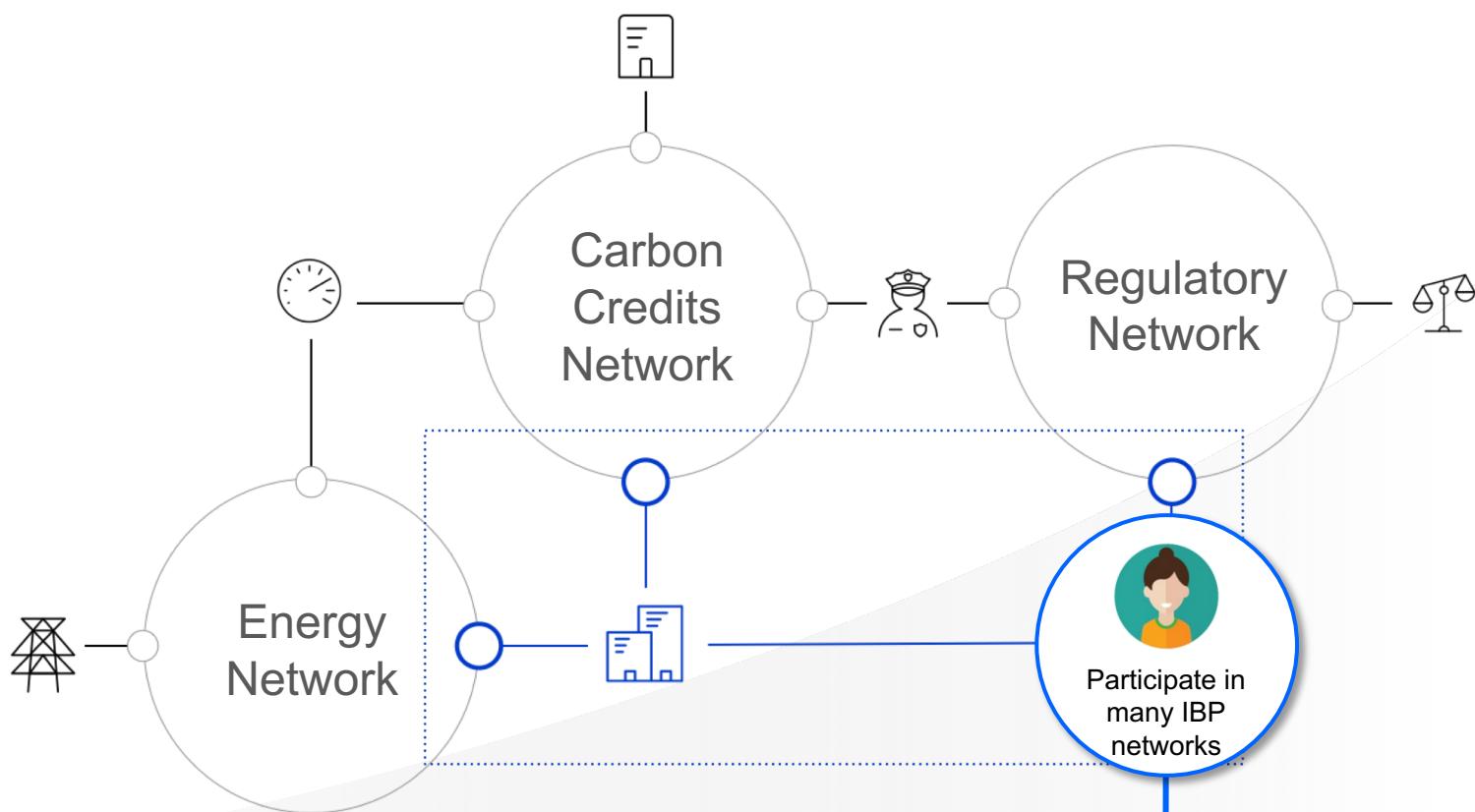
# Network created!

Your Starter Plan network has two organizations, each with its own peer.

With this network you can test chaincode, deploy samples, and invite other members to collaborate.

Launch





Your  
idea

The Business  
Network

Develop

Govern

Operate



## IBM Blockchain Platform Overview

*What you need to know*



## Getting Started

*The tools to make your blockchain real*



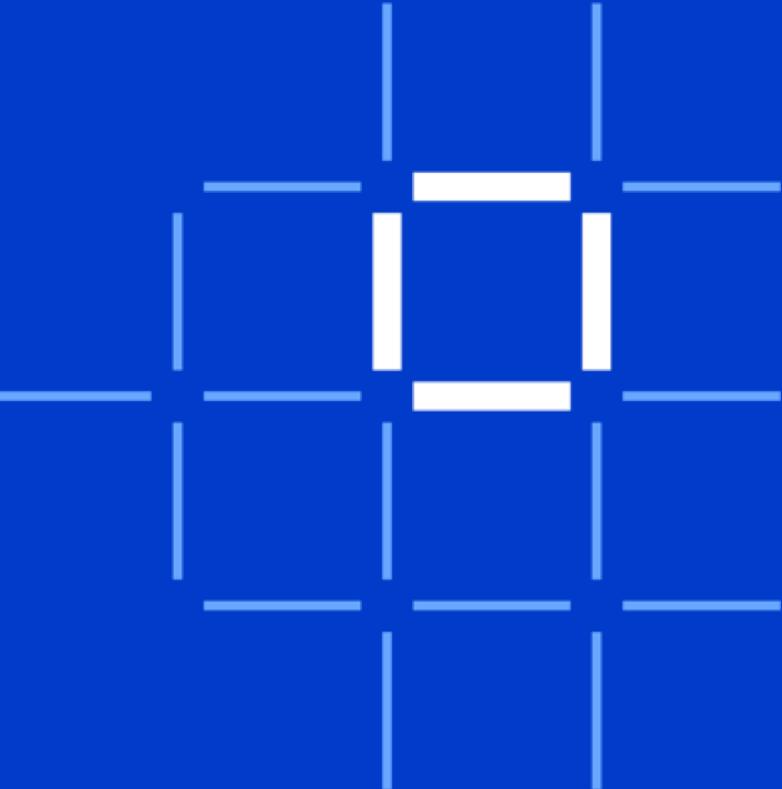
## Roadmap

*IBM's blockchain strategy and where the platform is going*



## Technical Details

*The architecture behind IBM Blockchain Platform*



# IBM Blockchain Strategy

Drive the development of **applications** for specific business use-cases, to be deployed to active **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 enterprise blockchain networks with speed and security



HYPERLEDGER

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

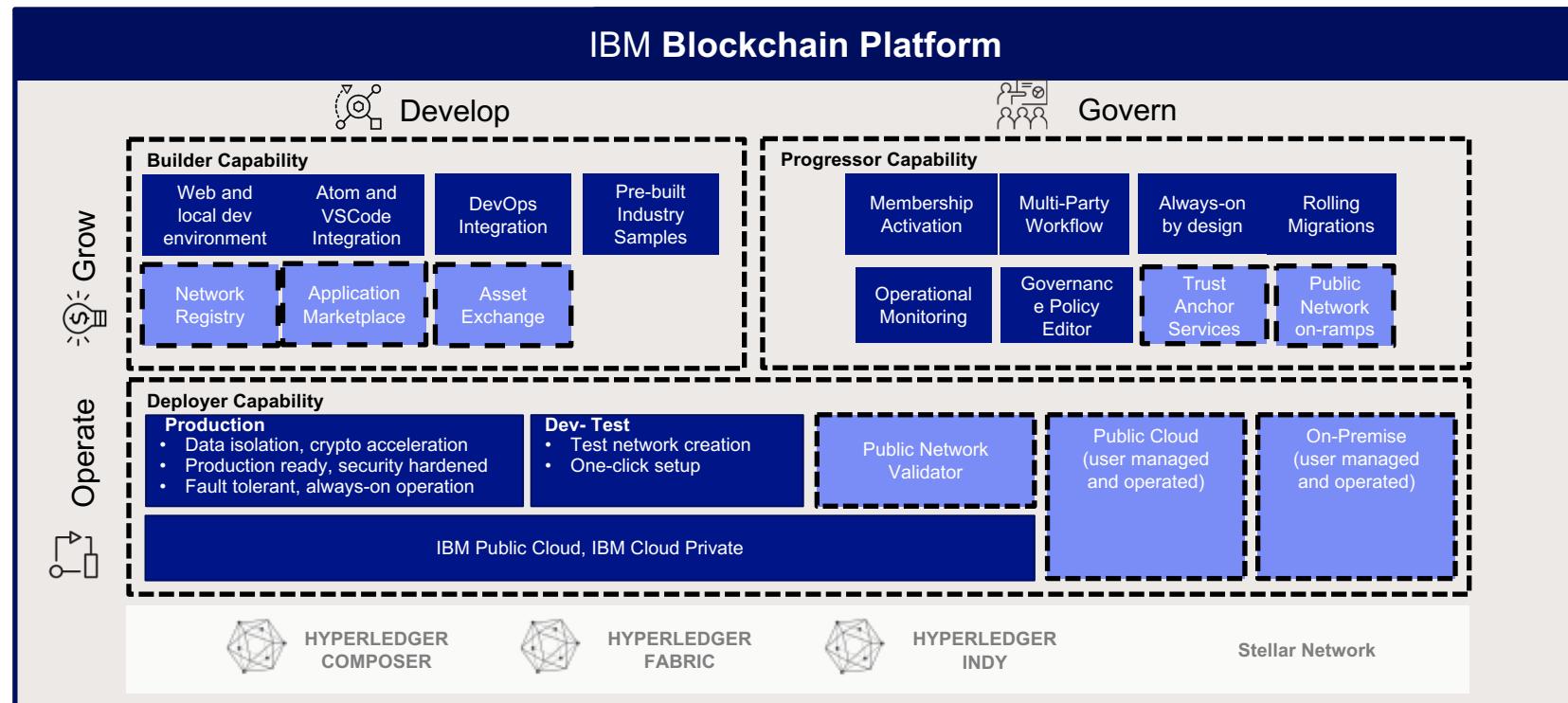
# IBM Blockchain Platform

## Solutions

Food Trust, universal payments, Global Trade Digitization, Identity, etc...

## IBM Extensions

Watson IOT, API Management, Messaging, Workflow etc...



# Hyperledger Fabric and Composer Roadmap (Linux Foundation)

	Q1	Q2	Q3	Q4
Fabric	<p><b>1.1 release</b></p> <ul style="list-style-type: none"><li>• JS Chaincode</li><li>• Channel events</li><li>• CouchDB indexes</li><li>• CRL</li><li>• Mutual TLS</li><li>• Connection profiles</li><li>• Performance and scale improvements</li><li>• Experimental: SideDB, fine-grained, access control etc.</li></ul>	<p><b>1.2 release</b></p> <ul style="list-style-type: none"><li>• UX improvements</li><li>• Technical debt</li><li>• Experimental from 1.1</li><li>• Native asset model</li><li>• Pluggable transaction mode</li><li>• State-based ownership</li><li>• Flexible policies for chain code governance</li><li>• Private transactions with SideDB</li><li>• Service Discovery</li><li>• Identity Mixer</li></ul>	<p><b>1.3 release</b></p> <ul style="list-style-type: none"><li>• Zero Knowledge Proof (confidential transactions)</li><li>• RAFT consensus</li><li>• Experimental: BFP consensus</li></ul>	<p><b>1.4 release</b></p> <ul style="list-style-type: none"><li>• TBD</li></ul>
Composer	<p><b>0.18 release</b></p> <ul style="list-style-type: none"><li>• Hyperledger Fabric JS Chaincode integration</li><li>• Cloud storage for network identities</li><li>• HSM support</li><li>• Enhanced data collection</li><li>• Application generator capability</li></ul>	<p><b>1.0 release</b></p> <ul style="list-style-type: none"><li>• Standalone test tool</li><li>• Additional industry samples</li><li>• Integrated documentation</li></ul>	<p><b>1.1 release</b></p> <ul style="list-style-type: none"><li>• Enhanced transaction processing function</li><li>• Onboarding and secure document store integrations</li></ul>	<p><b>1.2 release</b></p> <ul style="list-style-type: none"><li>• Public network integration</li></ul>

# IBM Blockchain Platform Roadmap

Q1	Q2	Q3	Q4
<ul style="list-style-type: none"><li><b>Starter plan- beta</b><ul style="list-style-type: none"><li>Ideal for getting started with IBM Blockchain</li><li>Running Fabric 1.1 with CouchDB and Composer</li><li>Offered on IBM Cloud</li></ul></li><li><b>Continued Enterprise Availability</b></li><li><b>Enterprise+ Plan (limited availability)</b><ul style="list-style-type: none"><li>Highest levels of security, isolation and disaster recovery for regulated industries</li></ul></li><li><b>Smart contracts and analytics tech preview</b><ul style="list-style-type: none"><li>Get insights from the ledger</li></ul></li></ul>	<ul style="list-style-type: none"><li><b>Enterprise support for Fabric V1.1 with CouchDB and Composer</b></li><li><b>IBM Blockchain Platform with IBM Cloud Private Beta</b></li><li><b>Enterprise+ GA</b></li><li><b>Industry samples and templates</b> for financial services, supply chain and energy and utilities</li></ul>	<ul style="list-style-type: none"><li><b>On ramps for public blockchain networks</b> (first Stellar and then Hyperledger Indy)</li><li><b>Network Registry</b><ul style="list-style-type: none"><li>Find and join other blockchain networks</li></ul></li><li><b>Asset marketplace</b><ul style="list-style-type: none"><li>Use APIs, templates and other applications to accelerate your blockchain project</li></ul></li><li><b>IBM Blockchain Platform with IBM Cloud Private GA</b></li><li><b>Multi-site Disaster Recovery</b></li><li><b>Zero knowledge proofs, SideDB and token capabilities</b></li><li><b>Global blockchain footprint expanding to 20+ data centers</b><ul style="list-style-type: none"><li>IBP certified to ISO27001 industry standard compliance, SOC2 Type2 and HIPAA planned for 2H18</li></ul></li></ul>	

# Blockchain Network Finder

[SIGN UP / LOG IN](#)[RESERVE NETWORK](#)

## Industry

### All Categories

- Accommodation and Food Services
- Admin. and Support
- Agriculture
- Arts (Entertainment and Recreation)
- Construction
- Educational Services
- Energy
- Finance and Insurance
- Healthcare
- Identity Management
- IoT - Asset Tracking
- IoT - Healthcare
- IoT - Location Based Services
- Management of Companies and Enterprises
- Manufacturing
- Media
- Mining and Oil and Gas Extraction
- Non-Profit
- Real Estate
- Real Estate Rental and Leasing
- Record Management
- Retail Trade
- Supply Chain Management
- Transportation and Warehousing
- Utilities
- Voting
- Waste Mgmt. and Remediation Services

 Search

A B C E F G J M N O S V W Y {

Name	Industry	Summary	Peers	Created Date
{{2+9}}			3	December 4th 2017, 4:21 AM
<b>artsexpo</b> Canada	Non-Profit		1	March 7th 2018, 2:41 AM
<b>besthouse</b> China	Real Estate, Real Estate Rental and Leasing		2	November 1st 2017, 9:48 AM
<b>coffeeshopschain</b> United States	Retail Trade, Supply Chain Management	This is the main chain for updates regarding Coffeeshops in the US - look here for updates, deals, promotions, branches...	3	January 4th 2018, 11:53 AM
<b>ecodisposal</b> USA	Waste Mgmt. and Remediation Services		4	November 1st 2017, 9:52 AM
<b>ewewde</b>		ВИСИВСИВСИВС	3	March 7th 2018, 12:12 AM
<b>fishmarket</b>	Agriculture, Supply Chain Management, Wholesale Trade	This is a Fish Market blockchain	3	March 6th 2018, 7:41 AM
<b>friendsid</b>			2	November 1st 2017, 8:42 AM
<b>garicoin</b>				November 1st 2017,

Discover  
other  
networks



Your  
idea

The Business  
Network



Develop



Govern



Operate



Grow

# Blockchain Asset Marketplace

[SIGN UP / LOG IN](#)[PUBLISH ASSETS](#)

## Carbon Credit Model

v3.4

Type: Composer model

Added by: Organization

Used in: 3057 networks

[TRY NOW](#)[BUY NOW](#)

## Simple Supply Chain

v5.3.6

Type: Composer model

Added by: OrganizationA

Used in: 208 networks

[TRY NOW](#)[BUY NOW](#)

## Bilateral Config

v1.2

Type: Network template

Added by: OrganizationB

Used in: 12 networks

[TRY NOW](#)[BUY NOW](#)

Asset  
marketplace



Your  
idea



The Business  
Network



Develop



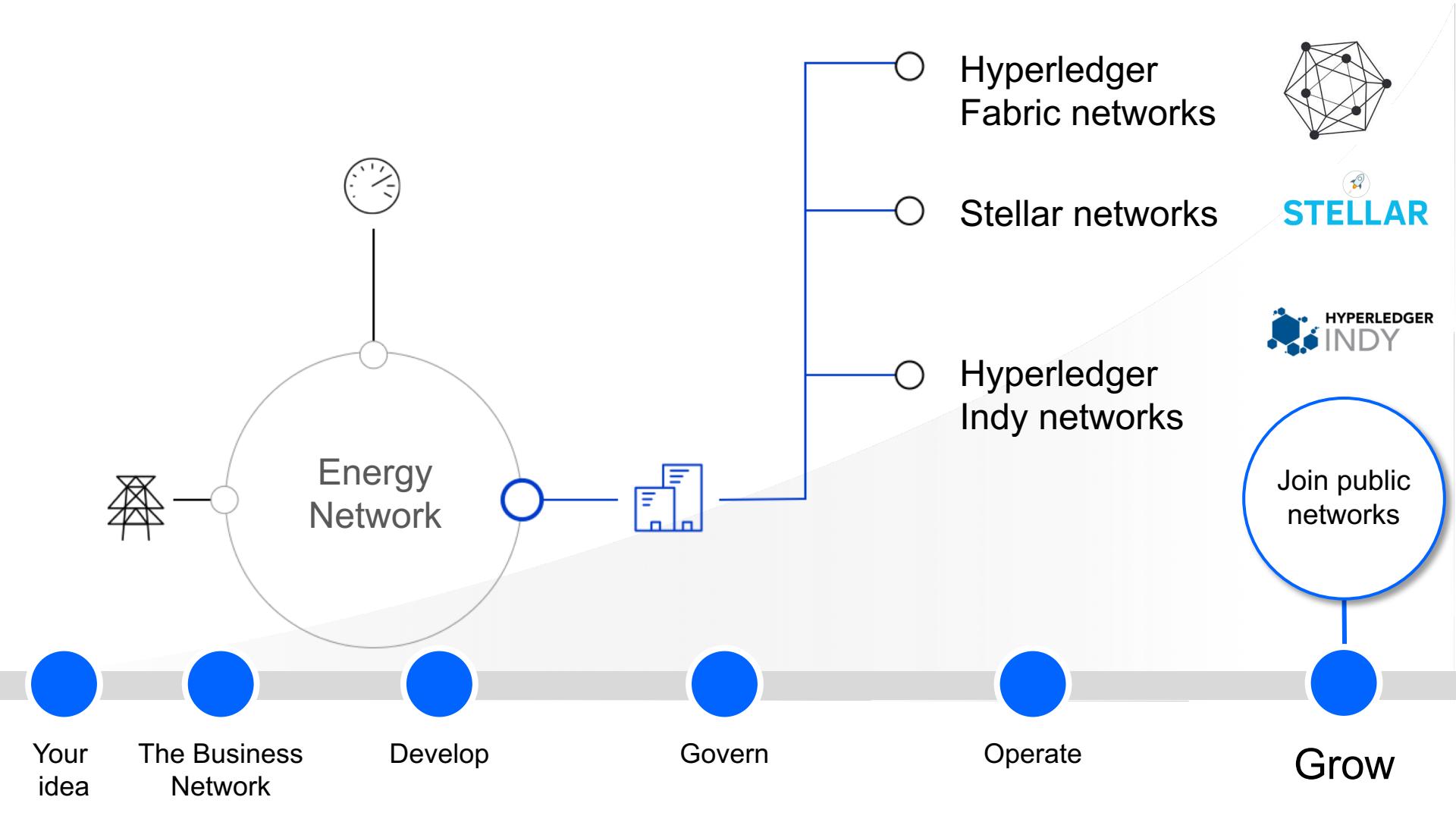
Govern



Operate



Grow





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*What you need to know*



## Getting Started

*The tools to make your blockchain real*



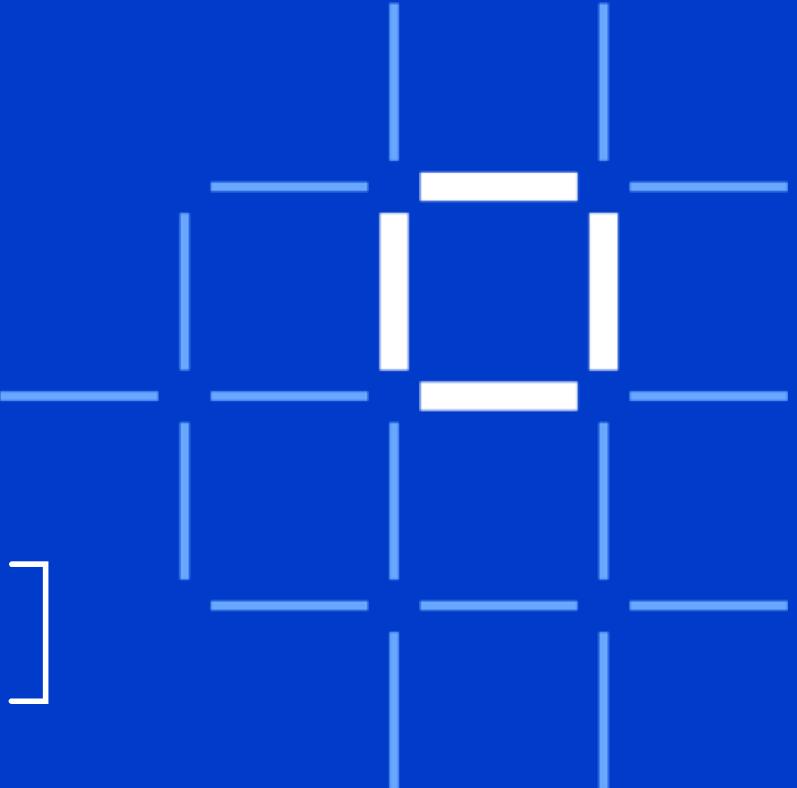
## Roadmap

*IBM's blockchain strategy and where the platform is going*



## Technical Details

*The architecture behind IBM Blockchain Platform*



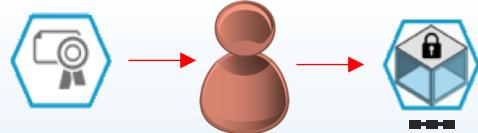
# Blockchain Technical Concepts



**Peers** are the networked services that maintain ledger state and run smart contracts



**Channels** are defined subsets of the peer network that share a single ledger



**Certificate authorities** provide identity services to participants on the network



**Smart contracts** constitute the transaction logic whose output is agreed by the peer network

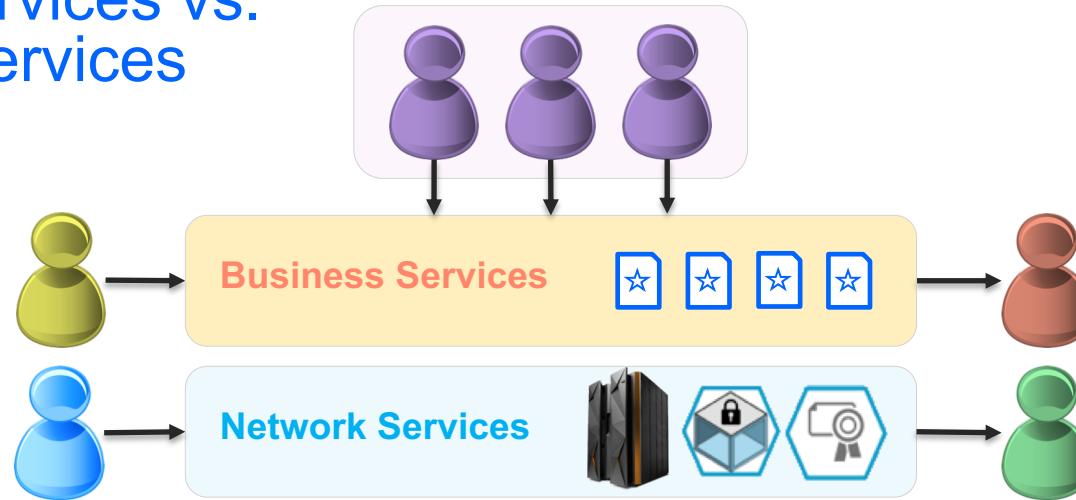


**Consensus** is the process by which agreement is obtained on the peer network



The **Ordering Service** agrees transaction sequence and distributes blocks to peers

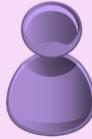
# Network Services vs. Business Services



- A good enterprise architecture consists of **Network Services** and **Business Services**
  - Network Services provide a technical computing foundation
  - Business Services are an abstraction that provide meaningful business context
- A blockchain network also consists of Network Services and Business Services
  - Peers, Channels, Ordering Service, etc. are Network Services
  - Smart Contracts and the APIs that invoke them are Business Services
- Depending on their role, blockchain stakeholders each **provide** or **consume** these services...

# Blockchain Participant Roles

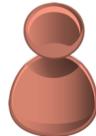
(A single organization may play multiple roles!)



End-user **runs** presentation logic  
(e.g. on mobile device or dashboard)



**Business Service Consumer** **hosts** application and integration logic which invoke blockchain transactions



**Business Service Provider** **develops** blockchain business applications, including transaction, app server, integration and presentation logic

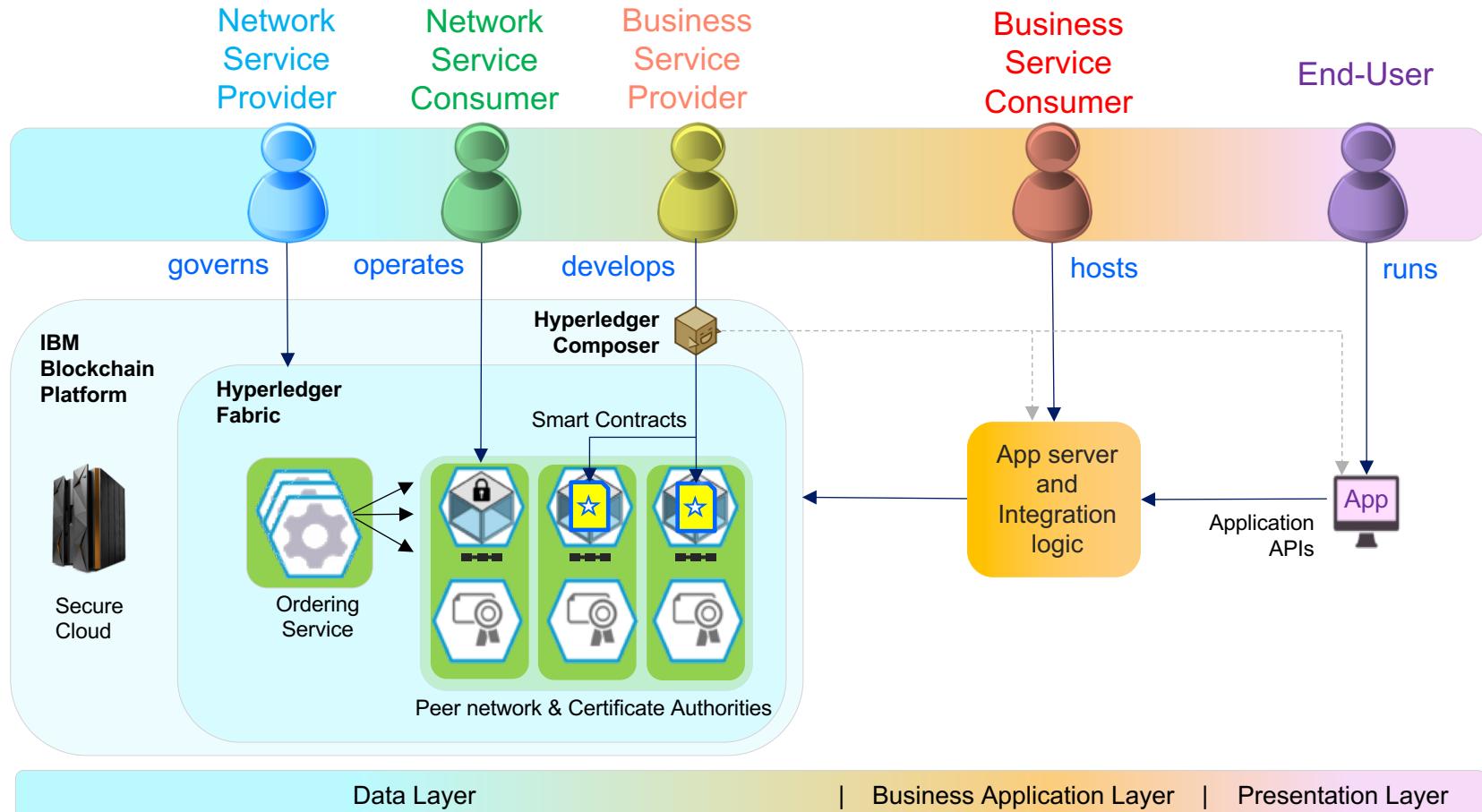


**Network Service Consumer** **operates** a set of peers and certificate authorities on the network; represents an organization on the business network

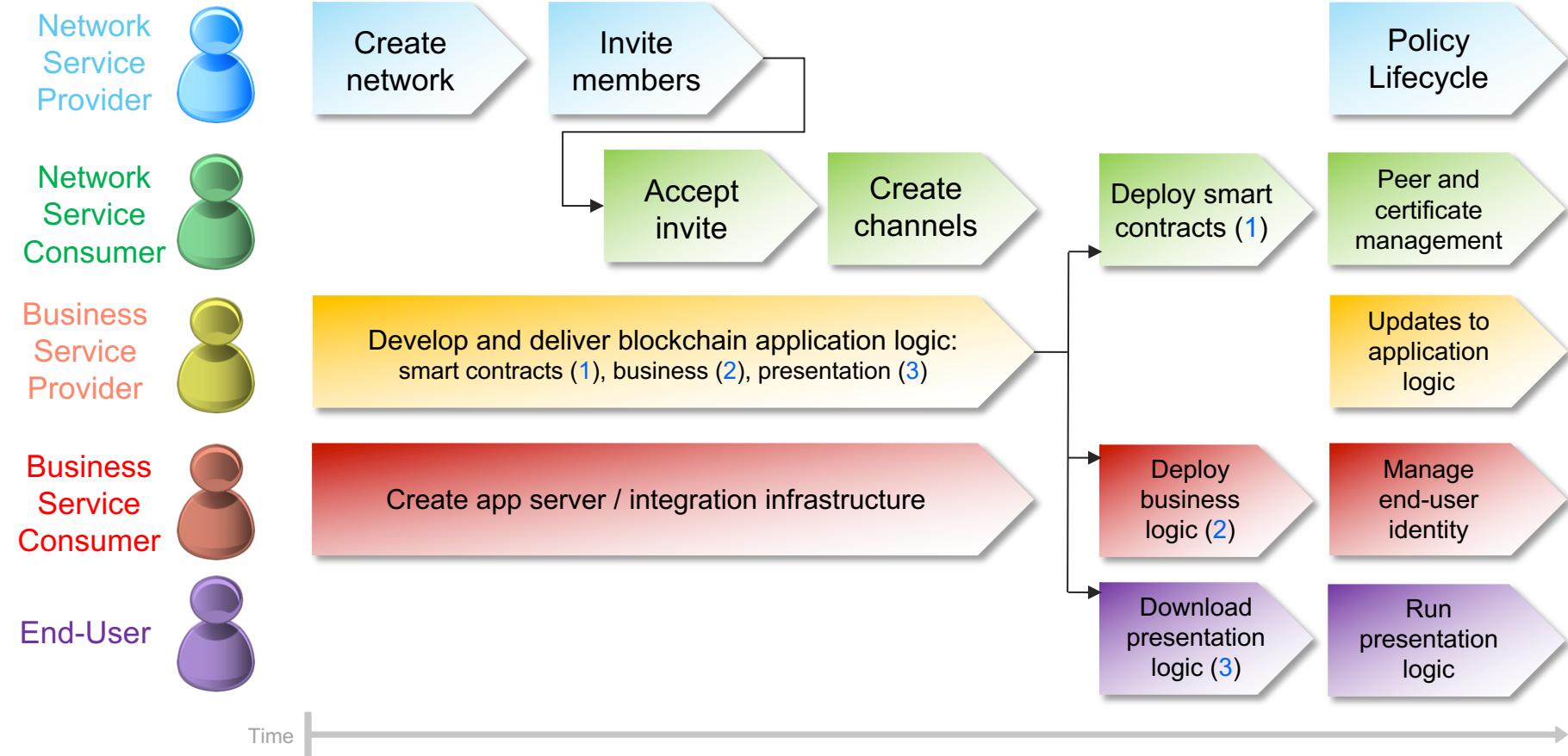


**Network Service Provider** **governs** changes to the network; a consortium of network members or designated authority

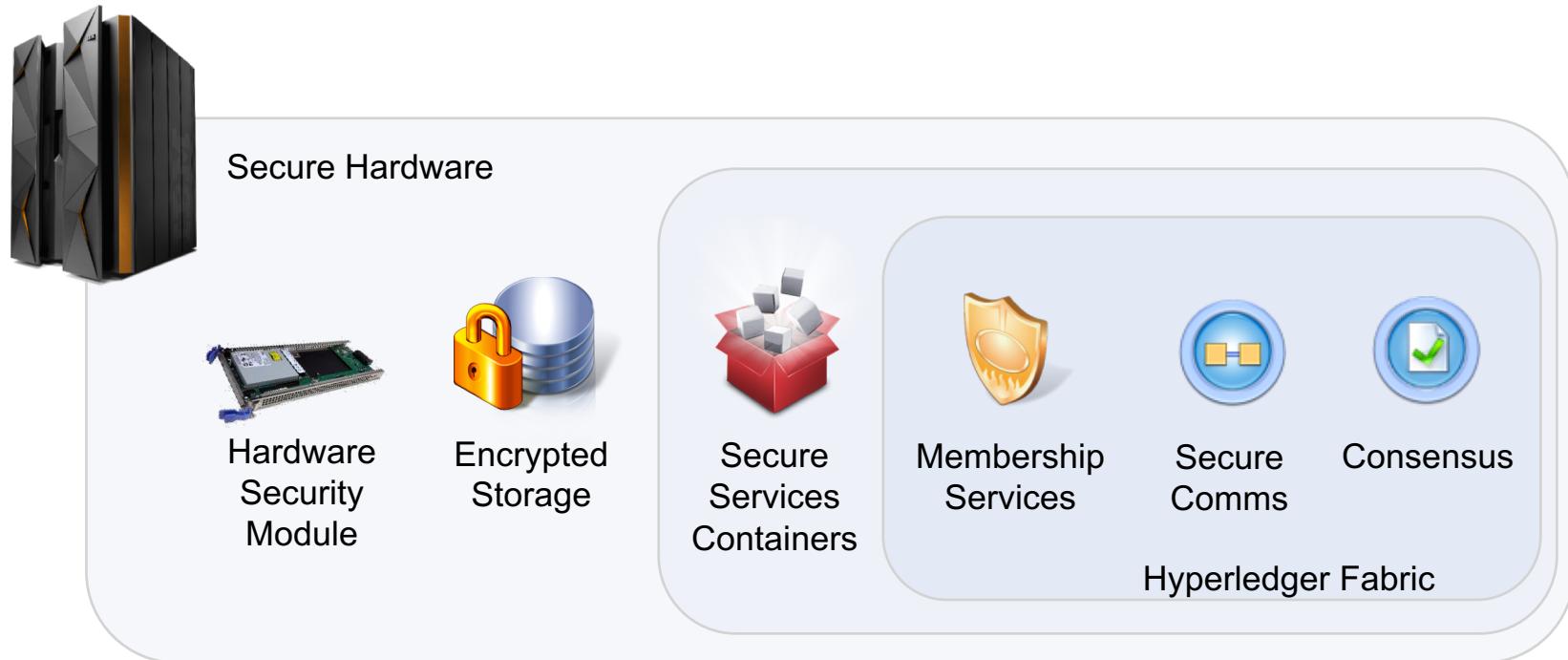
# Network Architecture and Participant Roles



# Workflow for Network Formation



# Security is implemented at each layer of the architecture



# 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
  - Keys stored in HSM certified to FIPS 140-2 level 4
  - Fastest cryptographic acceleration: used by block hashing and digital signatures

# Thank you

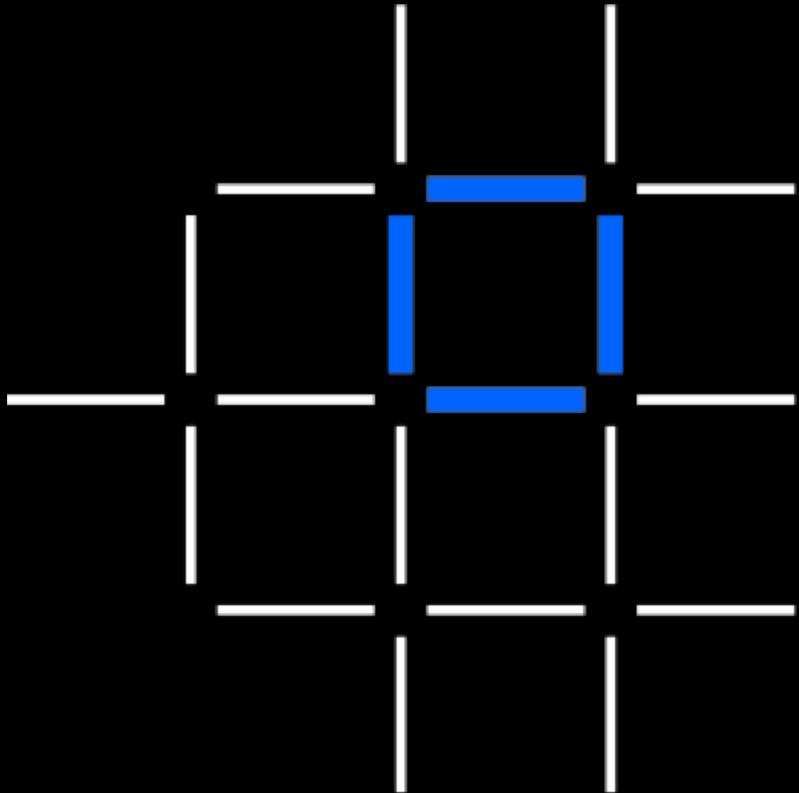
Jin VanStee

Questions? Tweet us or  
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