Hyperledger and Fabric v1

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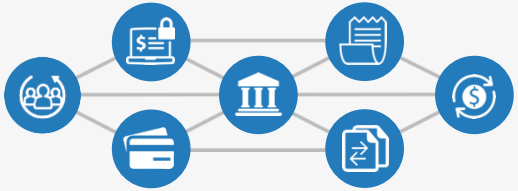
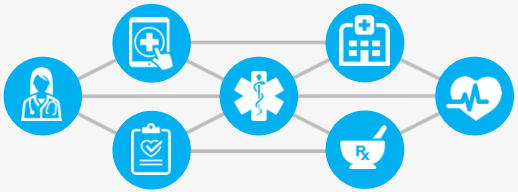
Shared Ledger Database

Blockchain allows different parties to securely interact with the same universal source of truth



Finance

Streamlined settlement, improved liquidity, increased transparency and new products/markets



Healthcare

Unite disparate processes, increase data flow and liquidity, reduce costs and improve patient experience and outcomes

Supply Chain

Track parts and service provenance, ensure authenticity of goods, block counterfeits, reduce conflicts

A World of Many Chains

There will not be only one blockchain, or a chain-of-all-chains.

There will be many public chains and millions of private chains, potentially each with a different consensus mechanism, preferred smart contract language/mechanism, and other characteristics.

The more common code underlying these chains, the better for everyone.

This is still early days – perhaps like 1994 and the Web?

Hyperledger

Open source
collaborative effort to advance cross-industry **blockchain technologies**

Hosted by
The Linux Foundation,
fastest-growing project in LF history

Global collaboration
spanning finance, banking, IoT, supply chains, manufacturing and technology

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THE LINUX FOUNDATION

Together with the global technology community, The Linux Foundation® is solving the world's hardest problems through open source and **creating the largest shared technology investment in history**.

With 16 years experience providing **governance structure, IT infrastructure and ecosystem development**, The Linux Foundation is the umbrella organization for **more than 50 open source projects** accelerating open technology development and commercial adoption.

Some of the game-changing initiatives hosted by The Linux Foundation include:

OPENCHAIN

Let's Encrypt

JS Foundation

OPEN CONTAINER INITIATIVE

CLOUD NATIVE COMPUTING FOUNDATION

Xen Project

OPEN DAYLIGHT

CORD

CORE INFRASTRUCTURE INITIATIVE

OPNFV

CLOUD FOUNDRY

node JS

yocto PROJECT

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300% Growth in year one!

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Premier Members

accenture
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Updated March 1

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Hyperledger's Modular Umbrella Approach

Infrastructure

Technical, Legal, Marketing, Organizational

Ecosystems that accelerate open development and commercial adoption

THE LINUX FOUNDATION

CloudFoundry | Node.js | Hyperledger | Open Container Initiative

Frameworks

Meaningfully differentiated approaches to business blockchain frameworks developed by a growing community of communities from the entire industry

Hyperledger Sawtooth | Hyperledger Iroha | Hyperledger Fabric | Hyperledger Indy | Hyperledger Burrow

Modules

Typically built for one framework, and through common license and community of communities approach, ported to other frameworks

Hyperledger Cello | Hyperledger Chaintool | Hyperledger Explorer | Hyperledger Composer

Community Working Groups

Working Groups are open to the public

Architecture Working Group	**Requirements Working Group**	**Identity Working Group**
Whitepaper Working Group	**Blockchain Protocol Working Group**	**Technical Working Group, China (TWG - China)**

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+ New Working Group on Performance and Scalability starting!

Community and Ecosystem Engagement

Regular participation and Hyperledger exhibits at cross-industry events.

Active engagement with technology and finance journalists and analysts to continue educating the market on Hyperledger. hyperledger.org/news

Regular online and face-to-face **hackfests**, **hackathons**, and **meetups**. Join our mailing lists to learn about these and other technical activities. hyperledger.org/community






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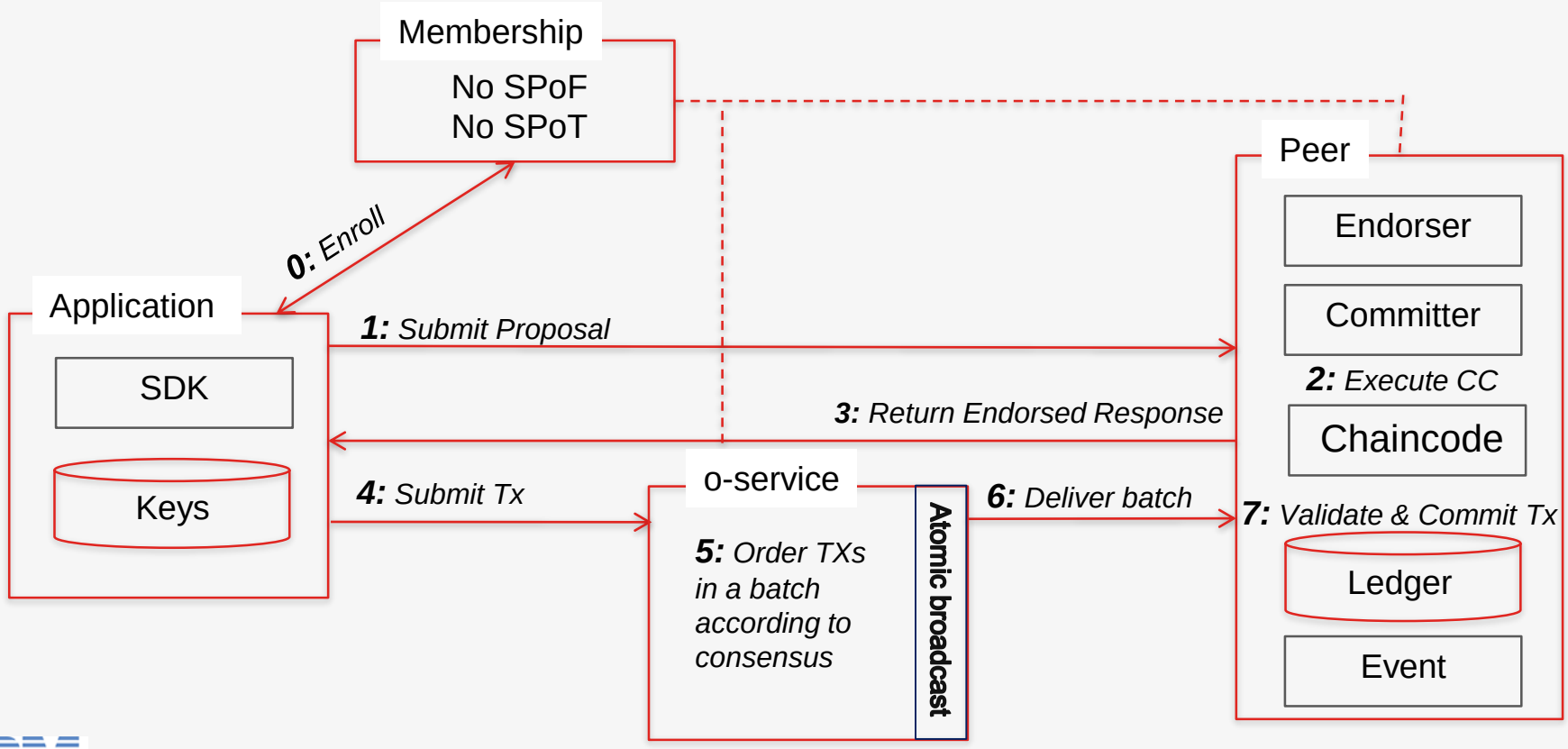
Hyperledger Fabric

- Graduated to « Active » status
- Stable release is on branch v0.6
- Focus now shifted to 1.0 on master branch
  - 1.0.0-alpha released on March 17th
  - 1.0.0-alpha2 released on May 19th

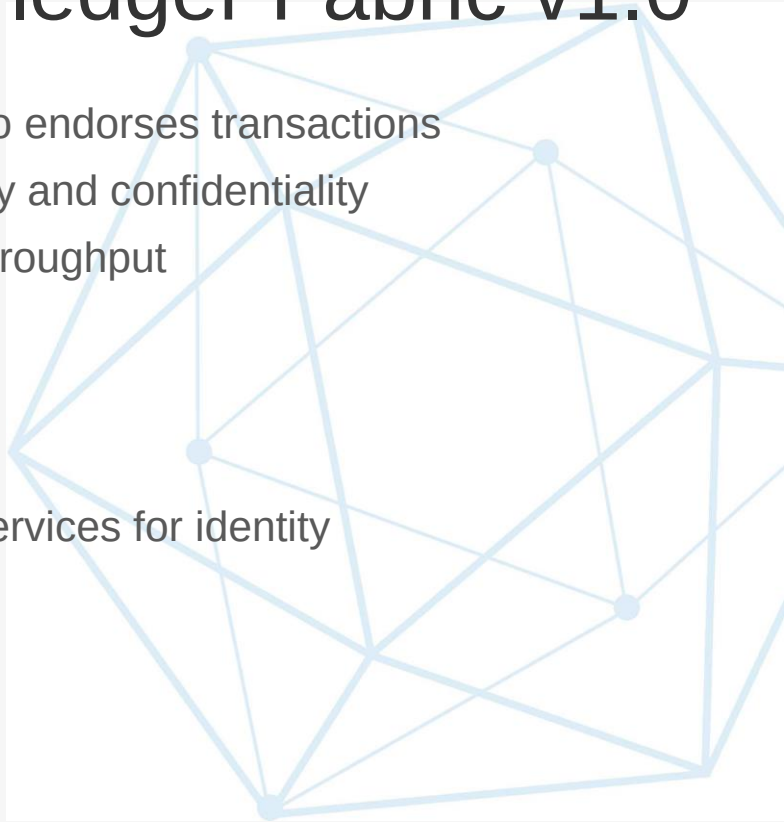
Hyperledger Fabric v1.0 Architecture



Based on Source : https://jira.hyperledger.org/browse/FAB-37

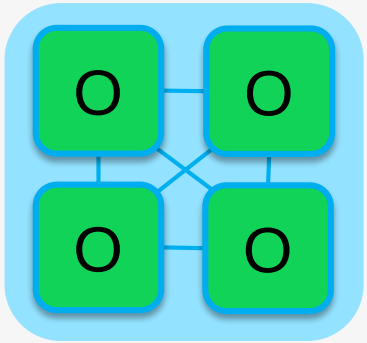
Key characteristics of Hyperledger Fabric v1.0

- Better reflect business processes by specifying who endorses transactions
- Support broader regulatory requirements for privacy and confidentiality
- Scale the number of participants and transaction throughput
- Eliminate non deterministic transactions
- Support rich data queries of the ledger
- Dynamically upgrade fabric and chaincode
- Support for multiple credential and cryptographic services for identity
- Support for ”bring your own identity”



Ordering Service

The ordering service packages transactions into blocks to be delivered to peers. Communication with the service is via channels.



Ordering-Service

Different configuration options for the ordering service include:

- **SOLO**
  - Single node for development
- **Kafka :** Crash fault tolerant consensus
  - 3:n nodes minimum
  - Odd number of nodes recommended
- **SBFT :** Byzantine fault tolerant consensus
  - 4:n nodes minimum

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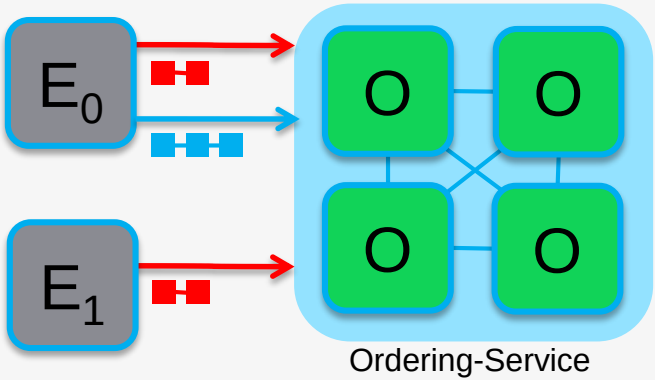
Channels

Separate channels isolate transactions on different ledgers



- Chaincode is installed on peers that need to access the worldstate
- Chaincode is instantiated on specific channels for specific peers
- Ledgers exist in the scope of a channel
  - Ledgers can be shared across an entire network of peers
  - Ledgers can be included only on a specific set of participants
- Peers can participate in multiple channels
- Concurrent execution for performance and scalability

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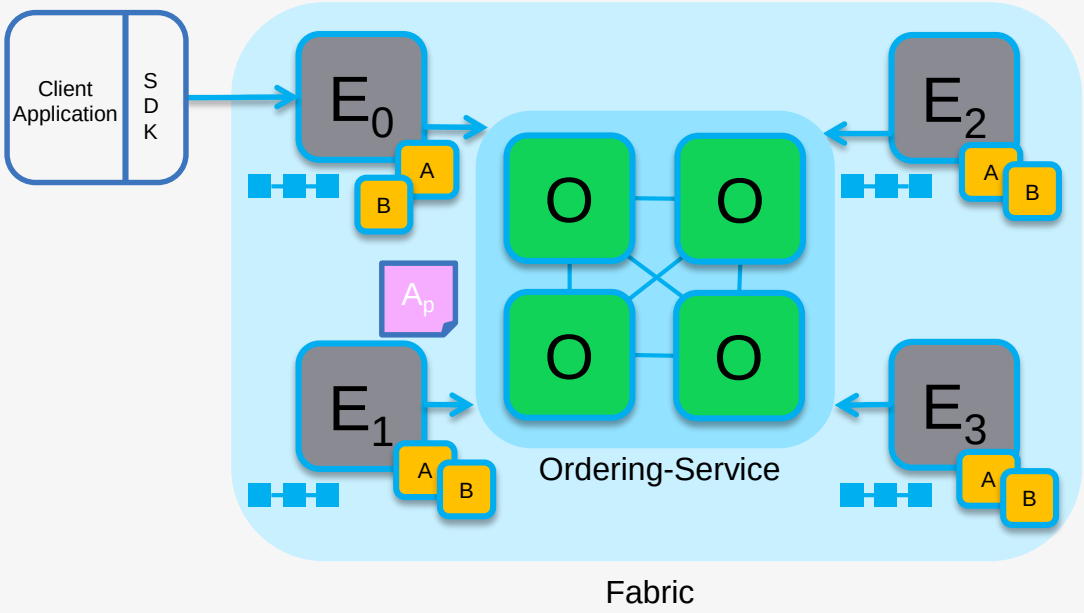
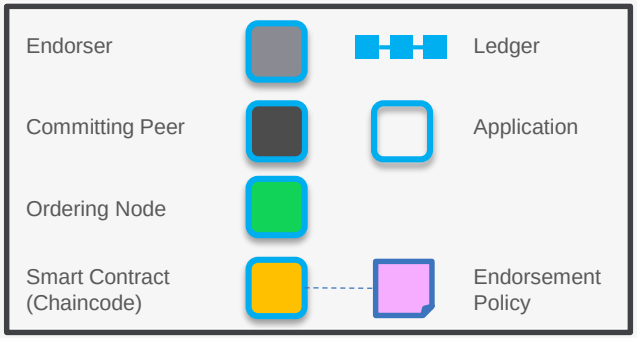
Single Channel Network

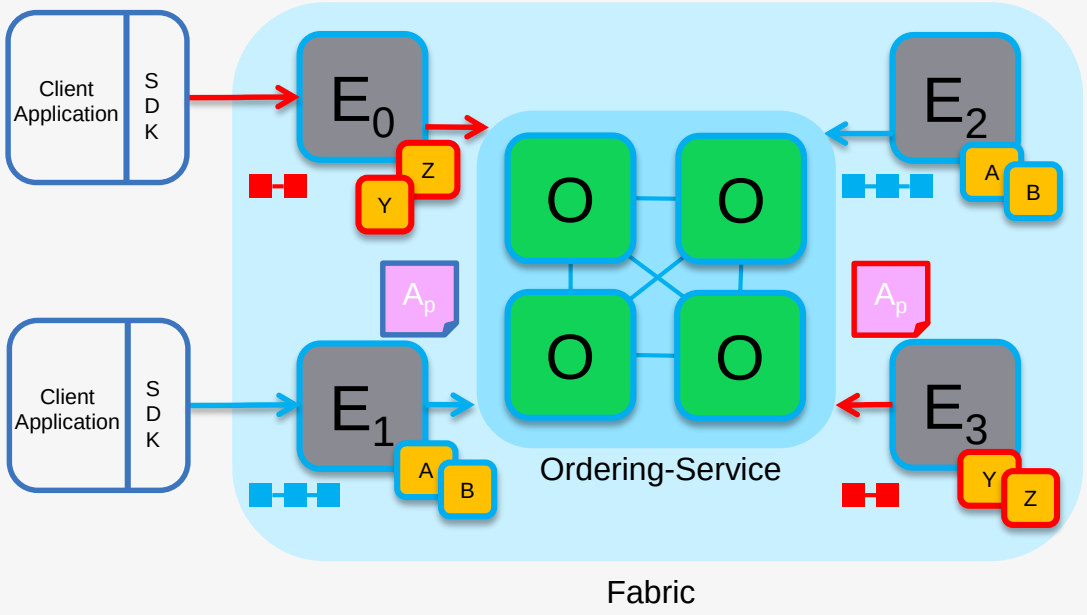


- Similar to 0.6 PBFT model
- All peers connect to the same system channel (blue).
- All peers have the same chaincode and maintain the same ledger
- Endorsement by peers E_0, E_1, E_2 and E_3

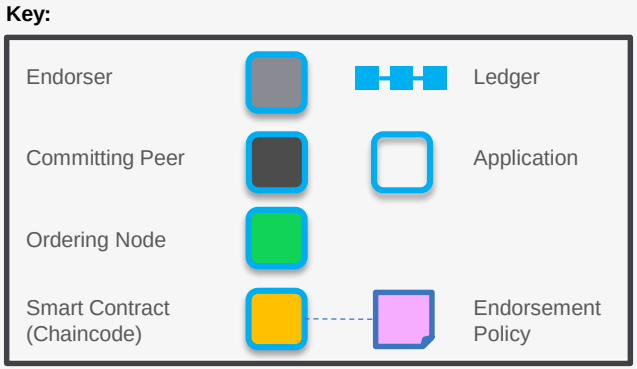
Key:



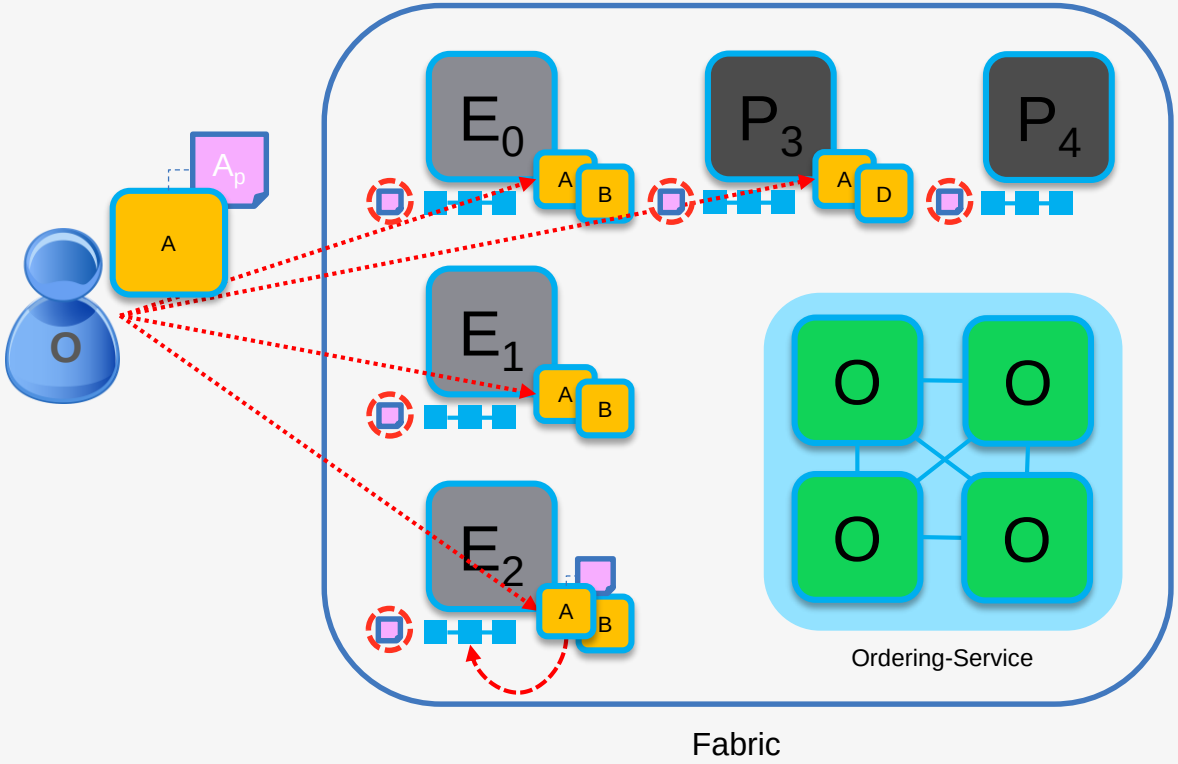
Multi Channel Network



- Peers E_0 and E_3 connect to the red channel for chaincodes **Y** and **Z**
- Peers E_1 and E_2 connect to the blue channel for chaincodes **A** and **B**



Installing and instantiating chaincode



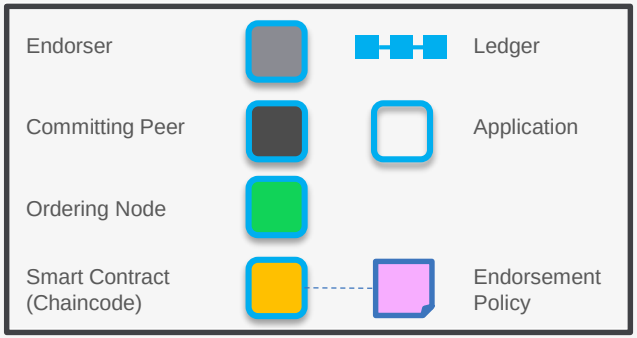
Operator installs then instantiates

Operator **installs** smart contracts with endorsement policies to appropriate peers: **E_0**, **E_1**, **E_2**, **P_3**, and not **P_4**

Operator **instantiates** smart contract on given channel. One-time initialization

Policy subsequently available to all peers on channel, e.g. including **P_4**

Key:



Endorsement Policies

Describe the conditions by which a transaction can be endorsed. A transaction can only be considered valid if it has been endorsed according to its policy.

- Each chaincode is associated with an Endorsement Policy
- Default implementation: Simple declarative language for the policy
- ESCC (Endorsement System ChainCode) signs the proposal response on the endorsing peer
- VSCC (Validation System ChainCode) validates the endorsements

Endorsement Policy Examples

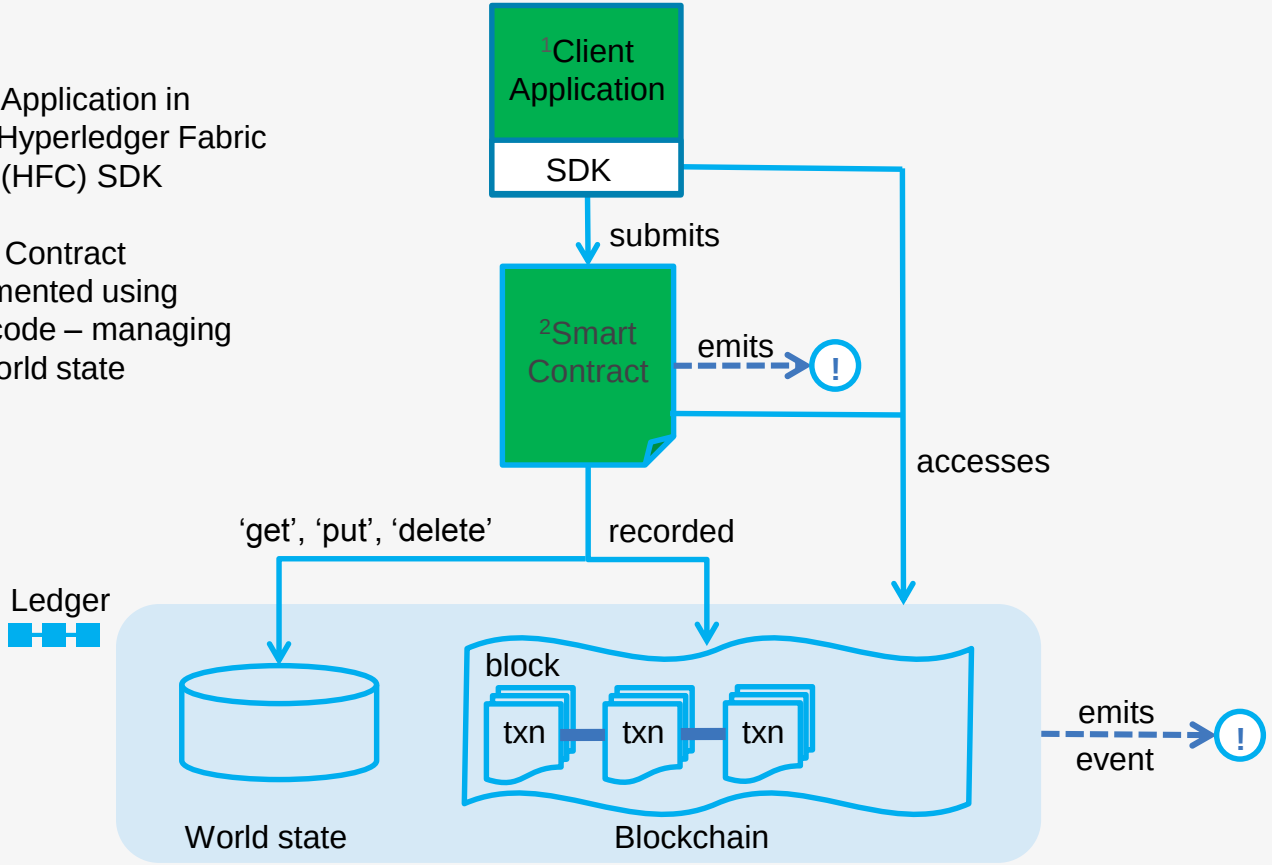
Examples of policies:

- Request 1 signature from all three principals
  - AND('Org1.member', 'Org2.member', 'Org3.member')
- Request 1 signature from either one of the two principals
  - OR('Org1.member', 'Org2.member')
- Request either one signature from a member of the Org1 MSP or (1 signature from a member of the Org2 MSP and 1 signature from a member of the Org3 MSP)
  - OR('Org1.member', AND('Org2.member', 'Org3.member'))

Application Developer's Focus: client + chaincode

1. Client Application in using Hyperledger Fabric Client (HFC) SDK

2. Smart Contract implemented using chaincode – managing the World state



Hyperledger Fabric Roadmap

Hack Fest docker images

- **60 participants tested**
- Basic v1 architecture in place
- Add / Remove Peers
- Channels
- Node SDK
- Go Chaincode
- Ordering Solo
- Fabric CA

V1 Alpha *

- Docker images
- Tooling to bootstrap network
- Fabric CA or bring your own
- Java and Node SDKs
- Ordering Services - Solo and Kafka
- Endorsement policy
- Level DB and Couch DB
- Block dissemination across peers via Gossip

V1 GA *

- Hardening, usability, serviceability, load, operability and stress test
- Java Chaincode
- Chaincode ACL
- Chaincode packaging & LCI
- Pluggable crypto
- HSM support
- Consumability of configuration
- Next gen bootstrap tool (config update)
- Config transaction lifecycle
- Eventing security
- Cross Channel Query
- Peer management APIs
- Documentation

V Next *

- SBFT
- Archive and pruning
- System Chaincode extensions
- Side DB for private data
- Application crypto library
- Dynamic service discovery
- REST wrapper
- Python SDK
- Identity Mixer (Stretch)
- Tcerts

2016 / 17 December

Connect-a-thon

- 11 companies in Australia, Hungary, UK, US East Coast, US West Coast, Canada dynamically added peers and traded assets

Connect-a-cloud

- Dynamically connecting OEM hosted cloud environments to trade assets

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*** Dates for Alpha, Beta, and GA are determined by Hyperledger community and are currently proposals.**

Proposed Alpha detailed content:
https://wiki.hyperledger.org/projects/proposedv1alphacontent

Getting started with Hyperledger Fabric

- Starter kit:
  - Start a simple network with 2 organizations running 2 peers
  - Docker images
  - Uses predefined enrollment certificates and « Solo » Ordering Service
- Start in devmode (minimal set up), then move to network (several peers), and security (membersrvc)
- Chaincode: init, invoke, *query (0.6 only)*
- Several examples to start from (marbles, car lease demo)

More on using Hyperledger Fabric

- Application integration via:
  - APIs: gRPC, REST (0.6)
  - 4 SDKs: Node.js, Python, Java, Go
- CLI: launch + interact with peers and interact with membersrvc/fabric-ca
  - Enroll / login
  - Peer start + stop
  - Channel create, join
  - Chaincode deploy, invoke, query
- Other images available: (fabric-couchdb, fabric-javaenv, etc.)
- Docker Images also available on Bluemix

Contributing to Hyperledger Fabric

- Contributor's focus : Framework development

  Several areas to choose from: core, chaincode, consensus, ledger, SDKs…

- Development environment:

  Linux Foundation ID
  In Vagrant or natively on Linux or Mac
  Repository and Code review on Gerrit
  Project management on JIRA

Getting Help

- Documentation: http://hyperledger-fabric.readthedocs.io
- Wiki: http://wiki.hyperledger.org/projects/fabric.md
- RocketChat: https://chat.hyperledger.org/channel/fabric
- Fabric mailing list: https://lists.hyperledger.org/pipermail/hyperledger-fabric/
- IBM Blockchain for developers: https://developer.ibm.com/courses/all-courses/blockchain-for-developers/
- Stackoverflow

Thank you!

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