When Hyperledger met Kubernetes!

Linux Foundation Open Source Leadership Summit
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Introducing Hyperledger
Join The 2019 Hyperledger Internship Program

Hyperledger is expanding its annual program to allow student developers the opportunity to work with and learn directly from active developers in the community. Hyperledger will sponsor 15 projects this year! Get involved by becoming a mentor or intern.

Learn More

Announcing New Project: Hyperledger Grid

We’re excited to announce the launch of our 12th project – Hyperledger Grid. Hyperledger Grid is a framework focused on accelerating the adoption of distributed ledger technologies for all types of cross-industry supply chains.

Read More

How Walmart Brought Unprecedented Transparency To Their Food Supply Chain With Hyperledger Fabric

Walmart embraced Hyperledger Fabric and blockchain technology as a way to quickly identify the cause of foodborne diseases and outbreaks, saving time, money and cutting down on food waste as a result.

Learn More
The Hyperledger Greenhouse

Business Blockchain Frameworks & Tools Hosted by Hyperledger

Frameworks
- Hyperledger Burrow: Permissionable smart contract machine (EVM)
- Hyperledger Fabric: Permissioned with channel support
- Hyperledger Grid: WebAssembly-based project for building supply chain solutions
- Hyperledger Indy: Decentralized identity
- Hyperledger Iroha: Mobile application focus
- Hyperledger Sawtooth: Permissioned & permissionless support; EVM transaction family

Tools
- Hyperledger Caliper: Blockchain framework benchmark platform
- Hyperledger Cello: As-a-service deployment
- Hyperledger Composer: Model and build blockchain networks
- Hyperledger Explorer: View and explore data on the blockchain
- Hyperledger Quilt: Ledger interoperability
- Hyperledger Ursa: Shared Cryptographic Library
Introducing CNCF
Sustaining and Integrating Open Source Technologies

The Cloud Native Computing Foundation builds sustainable ecosystems and fosters a community around a constellation of high-quality projects that orchestrate containers as part of a microservices architecture.

CNCF serves as the vendor-neutral home for many of the fastest-growing projects on GitHub, including Kubernetes, Prometheus and Envoy, fostering collaboration between the industry to standardize communities and ecosystems.
Kubernetes (k8s) is an open-source system for automating deployment, scaling, and management of containerized applications. It groups containers that make up an application into logical units for easy management and discovery. Kubernetes builds upon 15 years of experience of running production workloads at Google, combined with best-of-breed ideas and practices from the community.
When Hyperledger met Kubernetes
When Sawtooth met Kubernetes
Why Hyperledger Sawtooth

- Scalable, highly modular architecture
- Clear separation between network/application layers
- Solidity & Web Assembly smart contract compatibility
- Pluggable consensus mechanism
  - RAFT
  - PBFT
  - PoET
  - ...

@blockchaintp
High-level Sawtooth Architecture

- Clients
- REST Service
- Sawtooth Host
  - Validator
    - Interconnect
    - Block Management
    - Transaction Handling
    - Consensus
    - State
    - P2P Network
  - Transaction Processor(s)
- Other Validators

@blockchain@blockchaintp
Transaction Families: The Transaction Processor

All validators in the network run every authorized transaction processor

On receipt of a transaction the validator will call the TP’s Apply() method

Business logic simply goes in Apply() and gets and sets state as needed
Why Kubernetes

- Kubernetes is a portable, extensible open-source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation
- It has a large, rapidly growing ecosystem. Kubernetes services, support, and tools are widely available
- Cloud-agnostic and available on premises
- De facto standard for container orchestration - Just ask Docker!
Run Swarm and Kubernetes Interchangeably

Your choice of Swarm or Kubernetes for flexible and powerful orchestration options
Blockchain Management
A Blockchain isn’t just for the holidays!
Our Vision

▪ Radically **simplify** enterprise adoption of blockchain technologies

▪ Accelerate innovation by providing the **foundations** that businesses can build upon

▪ Ensure that enterprises focus on **business application development** not blockchain infrastructure
When Sawtooth met Kubernetes #2
Introducing Sextant

- Curated Hyperledger Sawtooth distribution
  - Professional open source support model
  - Built, tested and maintained by BTP engineers
  - Hosted in public BTP Docker Hub repository

- Comprehensive blockchain management platform
  - One click deployment of Hyperledger Sawtooth networks
  - Underpinned by cloud native Kubernetes runtime environment
  - Integral component of agile software development lifecycle (SDLC)
Sextant Architecture

Kubernetes Cluster

- Sextant Server
- Browsers
- Kubernetes Controlplane
  - Api Server
  - Controllers
  - etcd
- Sawtooth Node
  - Sawtooth Validator
  - State
- Transaction Processors
  - Settings
  - XO
  - Custom...
- Monitoring
- Dashboard

@blockchaintp
Demo
Demoing Sextant

Applications

Pods

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Ready</th>
<th>Status</th>
<th>IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>socoalkontach-monitoring-0</td>
<td>18 hours</td>
<td>2/2</td>
<td>Running</td>
<td>100.120.0.1</td>
</tr>
<tr>
<td>socoalkontach-validate-0</td>
<td>18 hours</td>
<td>16/10</td>
<td>Running</td>
<td>100.116.0.3</td>
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<td>16/10</td>
<td>Running</td>
<td>100.104.0.3</td>
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<tr>
<td>socoalkontach-validate-2</td>
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<td>16/10</td>
<td>Running</td>
<td>100.102.0.2</td>
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</table>

Services

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Type</th>
<th>Ports</th>
<th>ClusterIP</th>
<th>ExternalIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>grafana</td>
<td>18 hours</td>
<td>LoadBalancer</td>
<td>80:3000/TCP</td>
<td>100.99.200.77</td>
<td><code>8080</code>/tcp/3000</td>
</tr>
<tr>
<td>influxdb</td>
<td>18 hours</td>
<td>ClusterIP</td>
<td>3000/TCP</td>
<td>100.67.234.148</td>
<td><code>3000</code>/tcp</td>
</tr>
<tr>
<td>kubernetes</td>
<td>2 days</td>
<td>ClusterIP</td>
<td>443/TCP</td>
<td>100.94.3.1</td>
<td><code>443</code>/tcp</td>
</tr>
<tr>
<td>socoalkontach-nodeport</td>
<td>18 hours</td>
<td>NodePort</td>
<td>3000/TCP</td>
<td>100.99.221.60</td>
<td><code>3000</code>/tcp</td>
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<tr>
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<td>LoadBalancer</td>
<td>8080/TCP</td>
<td>100.70.218.192</td>
<td><code>8080</code>/tcp</td>
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<tr>
<td>socoalkontach-validate-1</td>
<td>18 hours</td>
<td>ClusterIP</td>
<td>30080/TCP</td>
<td>100.99.221.60</td>
<td><code>30080</code>/tcp</td>
</tr>
<tr>
<td>socoalkontach-validate-2</td>
<td>18 hours</td>
<td>LoadBalancer</td>
<td>8080/TCP</td>
<td>100.67.172.77</td>
<td><code>8080</code>/tcp</td>
</tr>
</tbody>
</table>

Cluster Settings

| Name: socoalkontach   | Domain: dev.catenasys.com |
| Topology: public | Masters: 1 |
| Master Type: m4.large | Master Zones: us-east-2a |
| Nodes: 3 | Node Type: m4.large |
| Network CIDR: 172.30.0.0/16 | Subnet Mask: 19 |

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Links

Hyperledger Sawtooth
- https://sawtooth.hyperledger.org/
- https://resources.blockchaintp.com/

BTP Sextant

- Hyperledger Global Forum
  - Running Hyperledger Sawtooth in Production