



Istio and Virtlet Service Mesh Demonstration

Or... The RETURN of the SMESH!

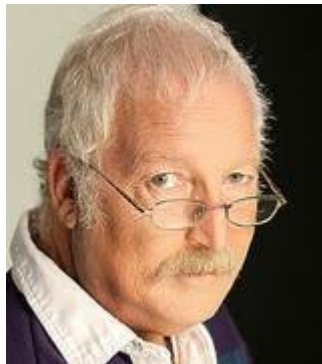


Introduction

Bruce Basil Mathews

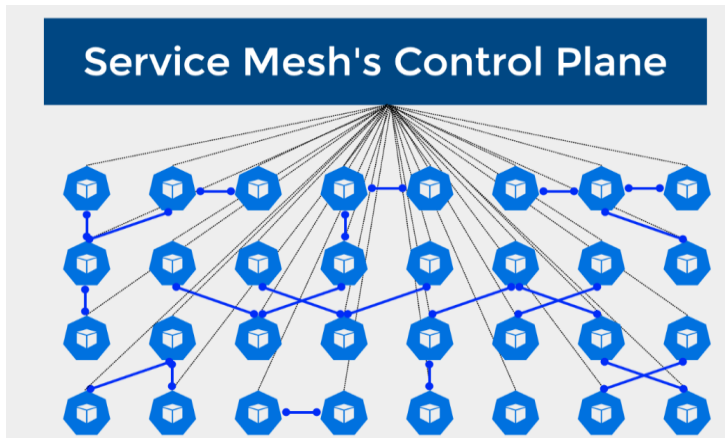
Sr. Solutions Architect at Mirantis

Bruce has been a Senior Solutions Architect in the computer industry for 40+ years, working at multiple technology companies including Mirantis, HP, Oracle, Sun Microsystems and others. Email Bruce: bmathews@mirantis.com



What is service mesh?

- Infrastructure layer making service to service communication safe fast and reliable
- Separate the application business logic from
 - Networking
 - Security
 - Observability



Service Mesh Architectures

Library

- Needed services are sitting in a Library that your microservices applications import and use.

Node Agent

- The services are provided by a Node Agent or daemon. The daemon services all of the containers on a particular node/machine.

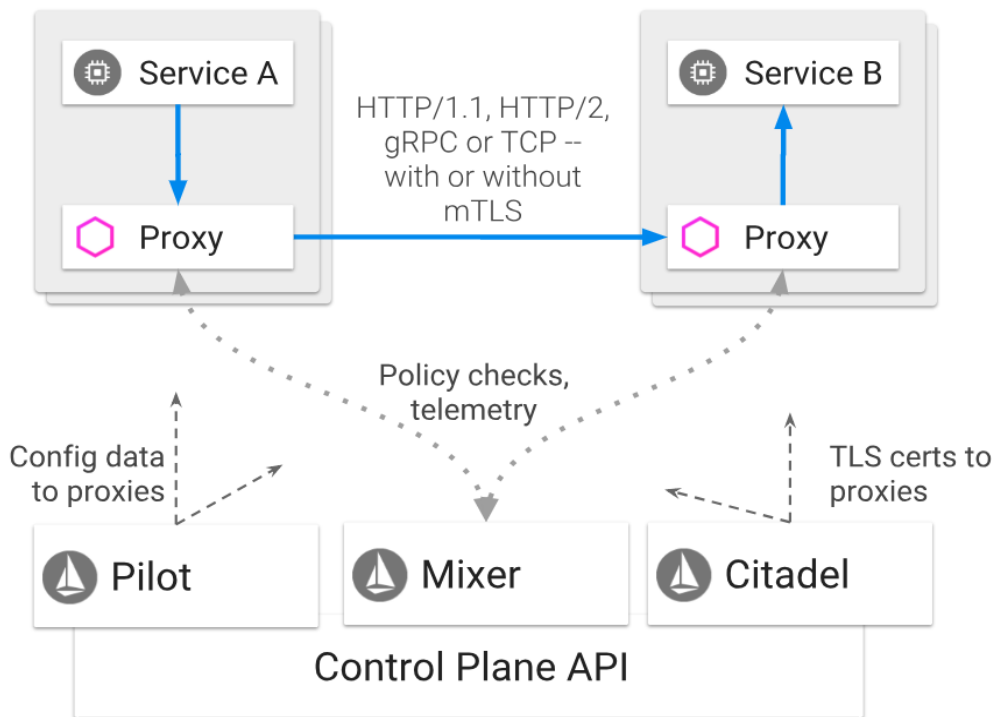
Sidecar

- The services are provided in a Sidecar container that runs alongside your application container.

What is ISTIO?

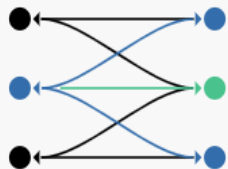
- Greek word for "sail"
- Istio is an open-source project
- The project was started by teams from Google and IBM, in partnership with the Envoy team at Lyft.
- Platform Independent
- Service mesh

ISTIO Architecture



- **Envoy** - is a high-performance proxy to mediate all inbound and outbound traffic for all services in the service mesh.
- **Pilot** - provides service discovery for the Envoy sidecars, traffic management capabilities for intelligent routing.
- **Mixer** - enforces access control and usage policies across the service mesh, and collects telemetry data from the Envoy proxy and other services.
- **Citadel** - provides strong service-to-service and end-user authentication with built-in identity and credential management

What does ISTIO provide?



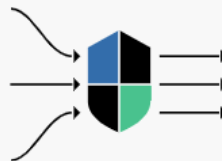
Connect

- Intelligent Routing
- Red/Black deployments
- Canaries
- Gradual upgrades



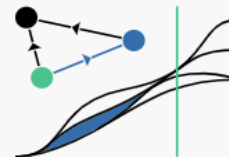
Secure

- Authentication
- Authorization
- Encryption



Control

- Enforce Policies
- Resource limits



Observe

- Service dependencies
- Traffic flow
- Tracing
- Monitoring and logging

What is a Virtlet?

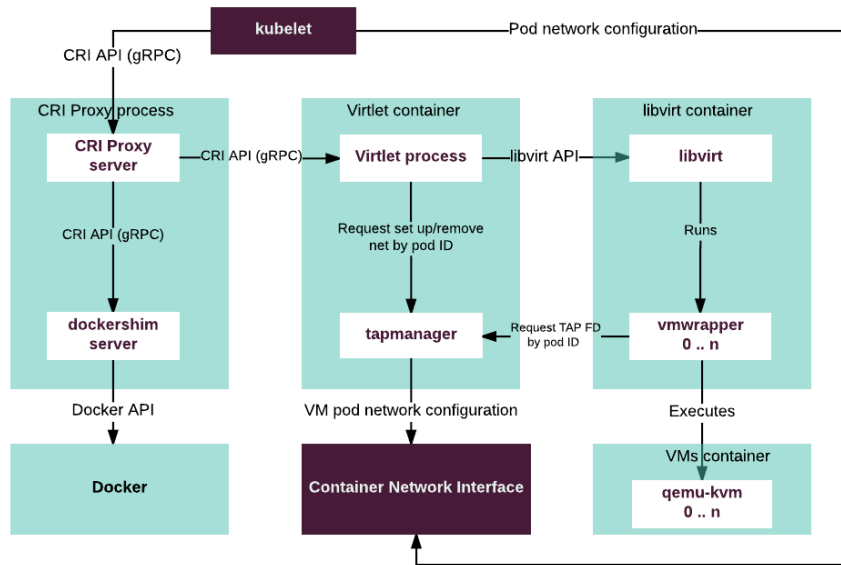
Kubernetes CRI implementation for running VM workloads

- Targeted at VM workloads that need to behave as containers on the outside
- Run unmodified OpenStack VM images using qcow2 format
- Build higher-level Kubernetes objects using VM pods
- Use familiar kubectl pod commands to work with your VMs
- Integrate with cluster networking using normal CNI plugins
- Easy to deploy - only need to install simple CRI Proxy package on the nodes

What does Virtlet Enable?

Virtlet enables you to run unmodified QEMU/KVM virtual machines that do not include an additional Docker layer as in similar solutions in Kubernetes. Virtlet supports all standard Kubernetes objects, such as ReplicaSets, Deployments, DaemonSets, and so on, as well as their operations.

The following diagram describes the Virtlet components and interactions between them:



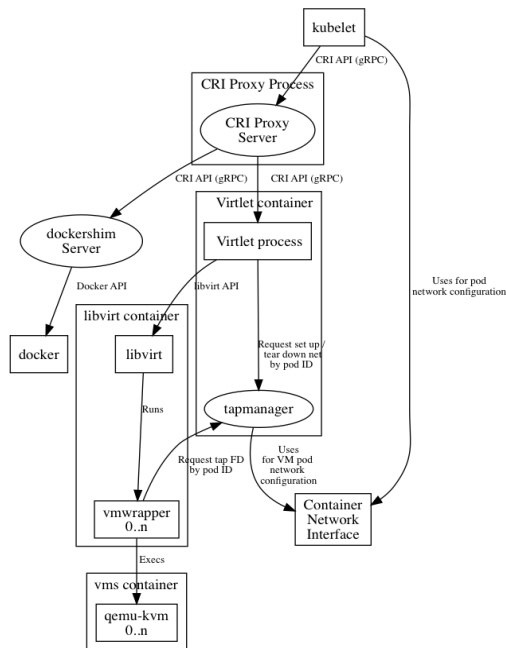
Virtlet Components

Virtlet includes the following components:

- Virtlet manager that implements CRI interfaces for virtualization and image handling
- A libvirt instance
- Virtlet tapmanager that is responsible for managing a VM networking
- Virtlet vmwrapper that is responsible for preparing environment for an emulator
- An emulator (QEMU with KVM support and with a possibility to disable KVM)
- Container Runtime Interface (CRI) Proxy that provides the ability to mix docker-shim and VM-based workloads on the same Kubernetes node

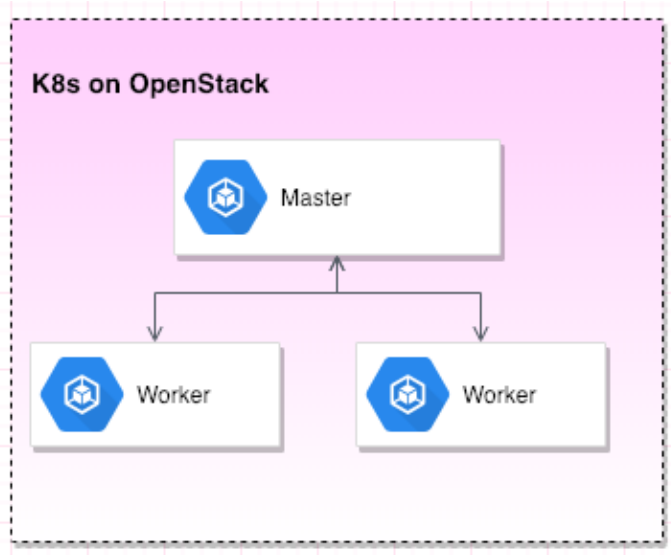
The Container Runtime Interface (CRI) Proxy

Container Runtime Interface (CRI) Proxy provides a way to run multiple CRI implementations on the same node, for example, Virtlet and dockershim. It enables running infrastructure pods such as kube-proxy. CRI Proxy reuses the dockershim component from kubelet to have Docker as one of CRI implementations on the multi-runtime nodes.



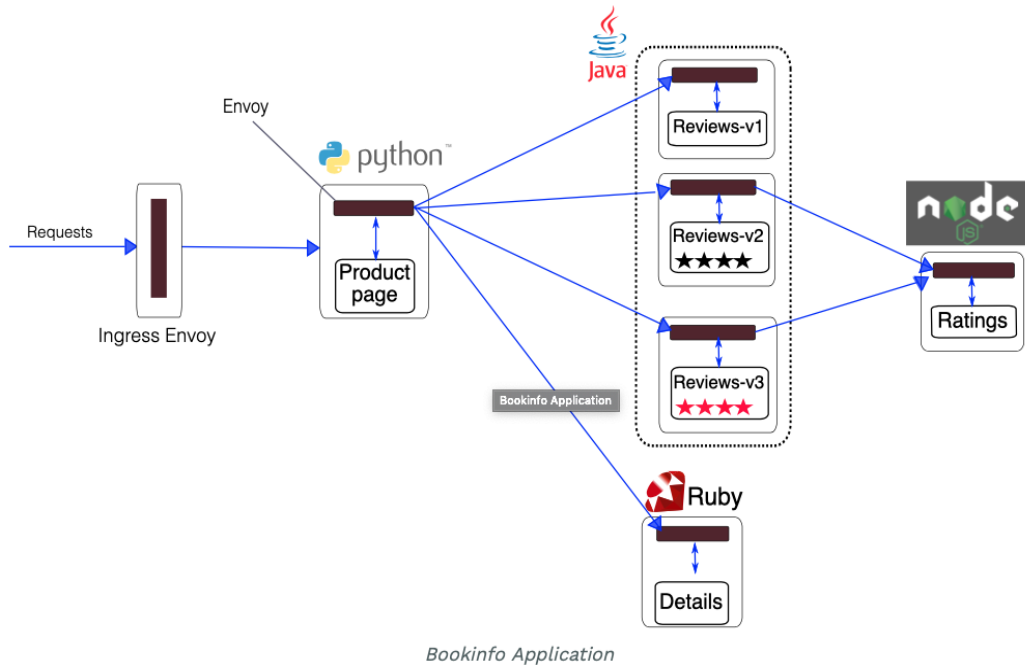
Demo

Lab Topology



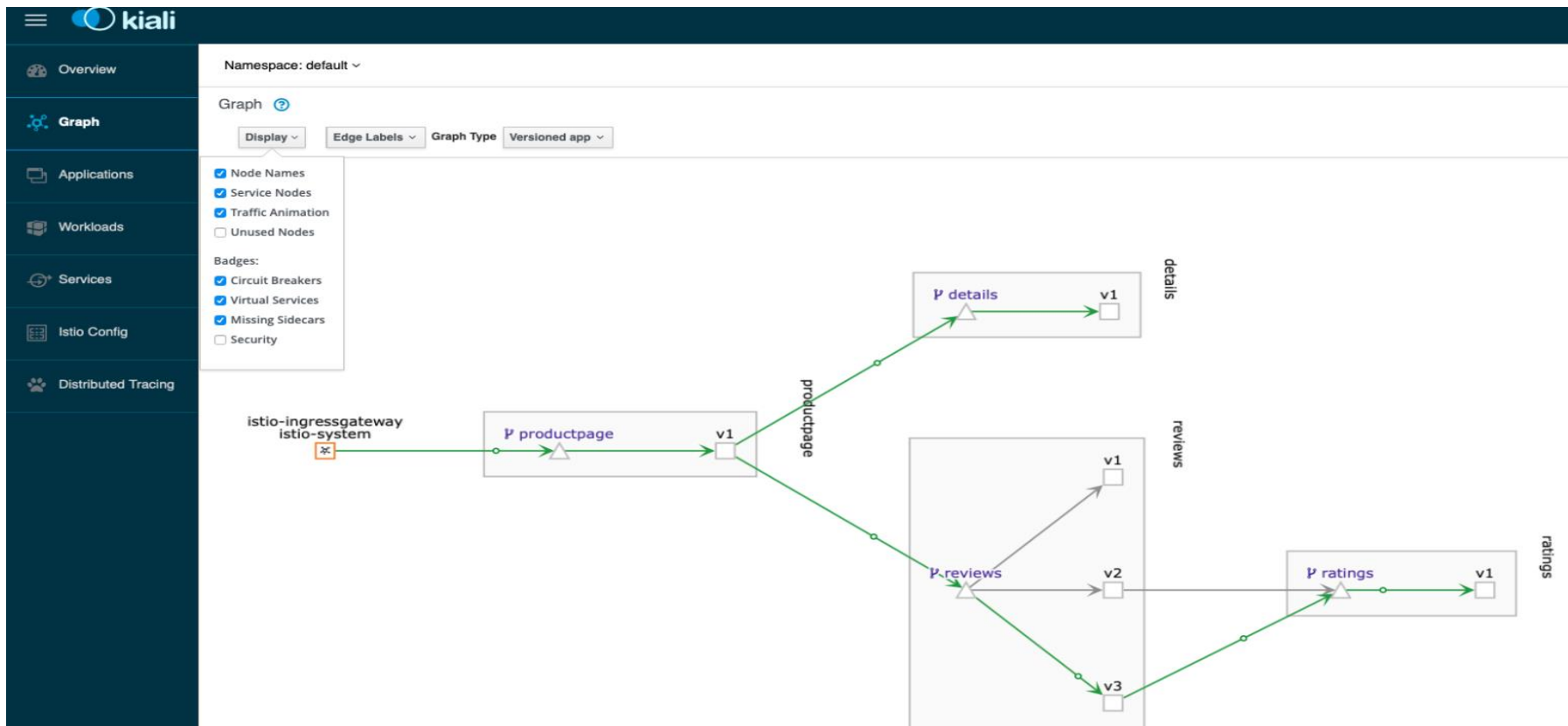
- Kubernetes installed using kubeadm
- One master
- Two worker nodes
- Kiali console installed
- BookInfo app installed

Application Topology



- <https://istio.io/docs/examples/bookinfo/>
- Polyglot application with several micro services

Service mesh observability



Some things of Note About the BookInfo Application

- The BookInfo application is being load balanced through the Node.js Proxy
- There are three separate Review instances registered with the load balancer
- Each of the Review container instances puts out a slight variation of the review for Reviewer 1 and Reviewer 2
- The color of the stars printed change from black to red or are not displayed at all.
- Refreshing the productpage shows the load balancing occurring

Simple BookInfo Application

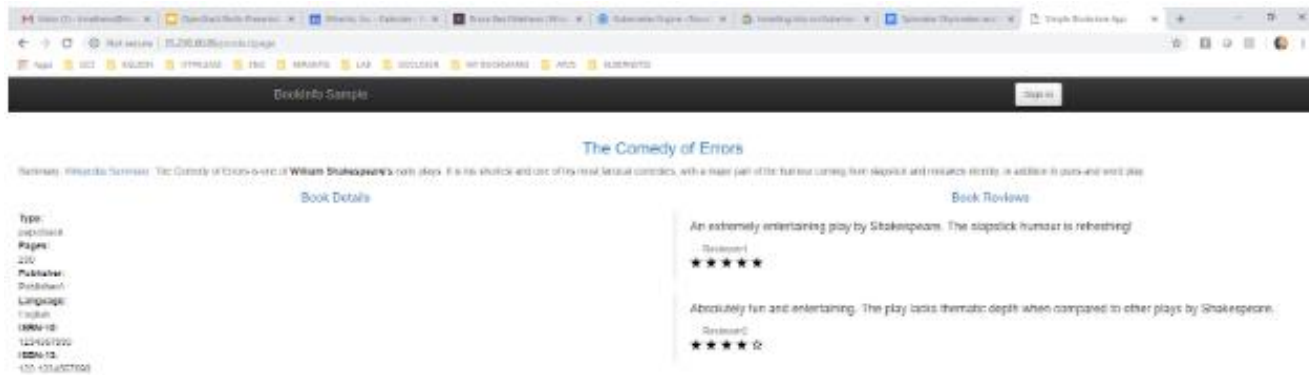
```
$ kubectl get svc istio-ingressgateway -n istio-system
```

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)
istio-ingressgateway	LoadBalancer	10.27.242.183	35.230.80.8	80:31380/TCP, 443:31390/TCP, 31400:31400/TCP, 15011:30570/TCP, 8060:30269/TCP, 853:32645/TCP, 15030:30155/TCP, 15031:32443/TCP

18m

Use the external IP to access the BookInfo application using the External IP, highlighted in red. In this case, the application is being assessed in a browser at: <http://35.230.80.86/productpage>

The web page will look like this:



Adding Virtlet and MySQL into the Mix to Feed Reviews to BookInfo

- Enable Virtlet in your existing cluster. Documentation found here: <https://docs.mirantis.com/mcp/q4-18/mcp-deployment-guide/deploy-mcp-cluster-manually/deploy-kubernetes-cluster-manually/enable-virtlet/deploy-virtlet.html>
- Install the ubuntu_vm_with_testuser VM into the 'default' namespace along side BookInfo. Documentation found here: https://docs.google.com/document/d/1pPhPP9HBe_WfTH6lBAjhw5iD1pqWljfeZDJV3EIG9HA/edit?ts=5c700cb8#heading=h.8m0mh0xht3ml
- Install MySQL on the Virtlet and follow the instructions for joining the mesh found here: <https://istio.io/docs/examples/integrating-vms/>
- A new load balanced instance is created which reads the MySQL database and displays the number of stars associated to each reviewer number.
- This MySQL review data only displays on every third refresh or so...

Virtlet Ubuntu Instance

Pods - Kubernetes Dashboard

https://10.11.0.10/api/v1/namespaces/kube-system/services/https:kubernetes-dashboard:/proxy/#/pod?namespace=default

Most Visited Getting Started statusopen | 10.11 Co... Sign in [Jenkins] Grafana Logs - Kibana Visualizer Prometheus Time Ser... Overview - Kubernetes... Login - OpenStack Da... Simple Bookstore App

kubernetes

Search

+ CREATE

Workloads > Pods

Cluster

Namespaces

Nodes

Persistent Volumes

Roles

Storage Classes

Namespace

default

Overview

Workloads

Cron Jobs

Daemon Sets

Deployments

Jobs

Pods

Replica Sets

Replication Controllers

Stateful Sets

Discovery and Load Balancing

Ingresses

Services

Config and Storage

Config Maps

Pods

Name	Node	Status	Restarts	Age
ratings-v2-mysql-vm-7877c8f74-nbk4v	cmp1	Running	0	3 days
reviews-v2-6677766d47-kvd9	cmp1	Running	0	3 days
details-v1-69658dcf78-cw9jg	cmp2	Running	0	3 days
productpage-v1-6b6798cb84-qznz	cmp2	Running	0	3 days
ratings-v1-6f97d68b6-r5mgw	cmp2	Running	0	3 days
reviews-v1-7c98dcd6dc-qzltr	cmp2	Running	0	3 days
reviews-v3-79f9bcc54c-qtaxm	cmp2	Running	0	3 days
ubuntu-vm-with-testuser	cmp2	Running	0	6 days
ciros-vm	cmp2	Running	0	6 days

Display Virtlet and MySQL Running

```
root@ctl01: ~  
root@ctl01:~# mysql -u admin -padmin -D test -h 192.168.119.80 -e "select * from ^  
ratings"  
Warning: Using a password on the command line interface can be insecure.  
+-----+-----+  
| ReviewID | Rating |  
+-----+-----+  
|      1   |      2   |  
|      2   |      5   |  
+-----+-----+  
root@ctl01:~#
```

```
root@ctl01: ~  
root@ctl01:~# kubectl get pods  
NAME                                READY   STATUS    RESTARTS   AGE  
cirros-vm                           1/1     Running   0           6d19h  
details-v1-69658dcf78-cw9jg         2/2     Running   0           3d15h  
productpage-v1-6b6798cb84-qznz     2/2     Running   0           3d15h  
ratings-v1-6f97d68b6-r5mgw         2/2     Running   0           3d15h  
ratings-v2-mysql-vm-7877c8f74-nbk4v 2/2     Running   0           3d15h  
reviews-v1-7c98dcd6dc-qzltr         2/2     Running   0           3d15h  
reviews-v2-6677766d47-kvdk9        2/2     Running   0           3d15h  
reviews-v3-79f9bcc54c-qtsxm        2/2     Running   0           3d15h  
ubuntu-vm-with-testuser            1/1     Running   0           6d18h  
root@ctl01:~# kubectl attach -it ubuntu-vm-with-testuser  
Defaulting container name to ubuntu-vm.  
Use 'kubectl describe pod/ -n default' to see all of the containers in this pod.  
If you don't see a command prompt, try pressing enter.  
  
root@ubuntu-vm-with-testuser:/etc/mysql/mariadb.conf.d# cd  
root@ubuntu-vm-with-testuser:~# hostname -I  
192.168.119.80  
root@ubuntu-vm-with-testuser:~# |
```

BookInfo Display with 2 Stars for Reviewer 1 and 5 Stars for Reviewer 2

BookInfo Sample [Sign in](#)

The Comedy of Errors

Summary: [Wikipedia Summary](#): The Comedy of Errors is one of **William Shakespeare's** early plays. It is his shortest and one of his most farcical comedies, with a major part of the humour coming from slapstick and mistaken identity, in addition to puns and word play.

Book Details

Type:
paperback
Pages:
200
Publisher:
PublisherA
Language:
English
ISBN-10:
1234567890
ISBN-13:
123-1234567890

Book Reviews

An extremely entertaining play by Shakespeare. The slapstick humour is refreshing!

— Reviewer1
★ ★ ★ ☆ ☆

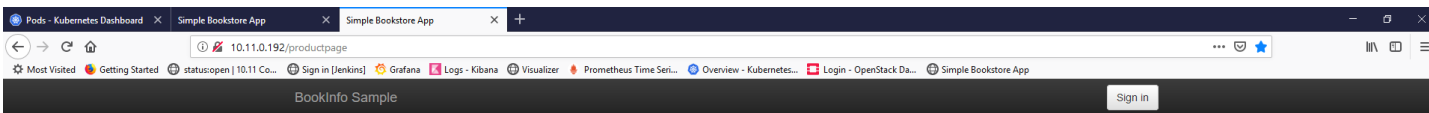
Absolutely fun and entertaining. The play lacks thematic depth when compared to other plays by Shakespeare.

— Reviewer2
★ ★ ★ ★ ★

Modify the MySQL Database to 5 Stars for Reviewer 1 and 2 Stars for Reviewer 2

```
root@ctl01: ~  
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.  
  
mysql> update ratings set rating=5 where reviewid=1;  
Query OK, 1 row affected (0.01 sec)  
Rows matched: 1  Changed: 1  Warnings: 0  
  
mysql> update ratings set rating=2 where reviewid=2;  
Query OK, 1 row affected (0.01 sec)  
Rows matched: 1  Changed: 1  Warnings: 0  
  
mysql> commit;  
Query OK, 0 rows affected (0.00 sec)  
  
mysql> select * from ratings  
-> ;  
+-----+-----+  
| ReviewID | Rating |  
+-----+-----+  
|          1 |      5 |  
|          2 |      2 |  
+-----+-----+  
2 rows in set (0.00 sec)  
  
mysql>
```

BookInfo Display with 5 Stars for Reviewer 1 and 2 Stars for Reviewer 2



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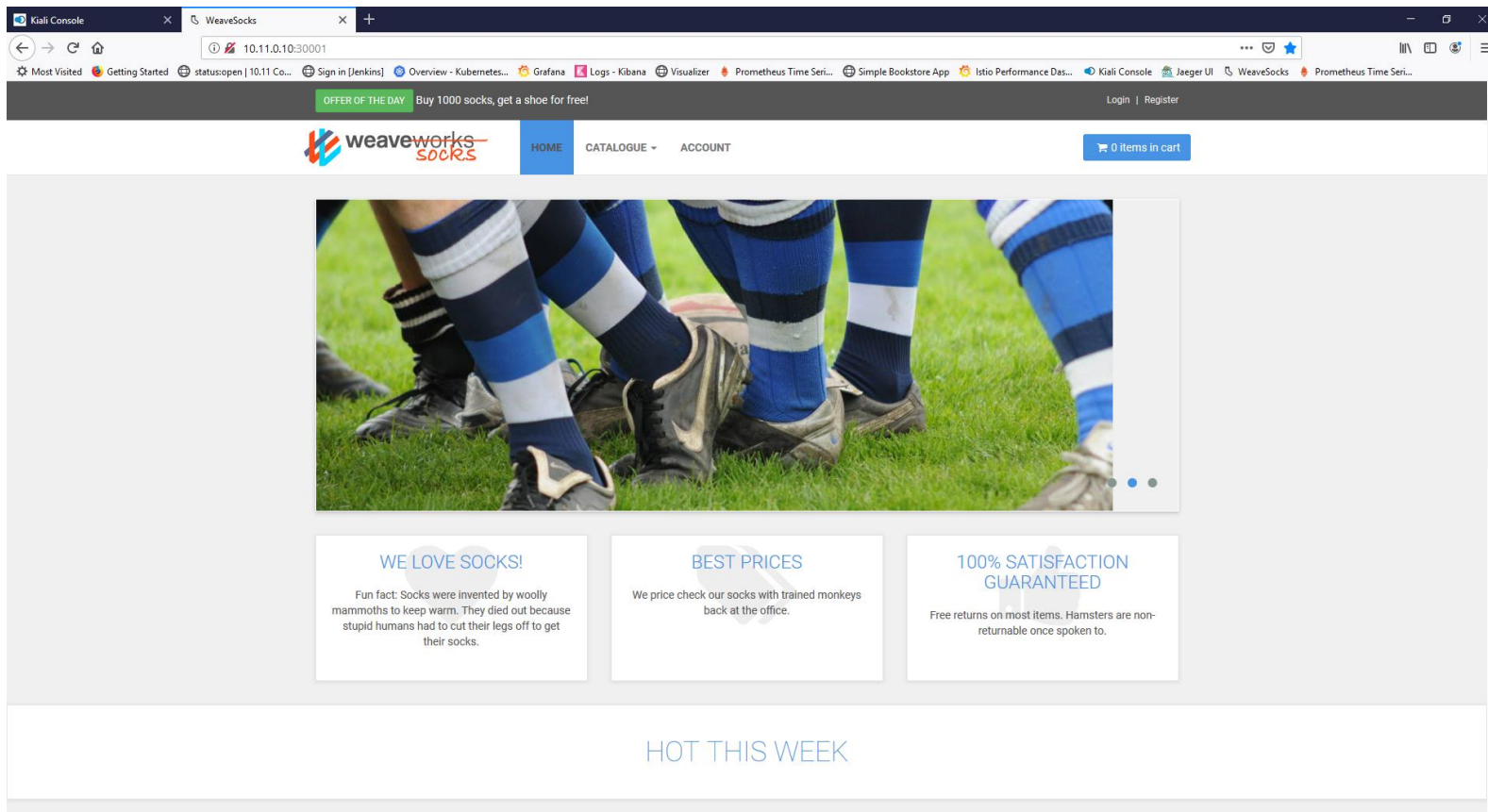
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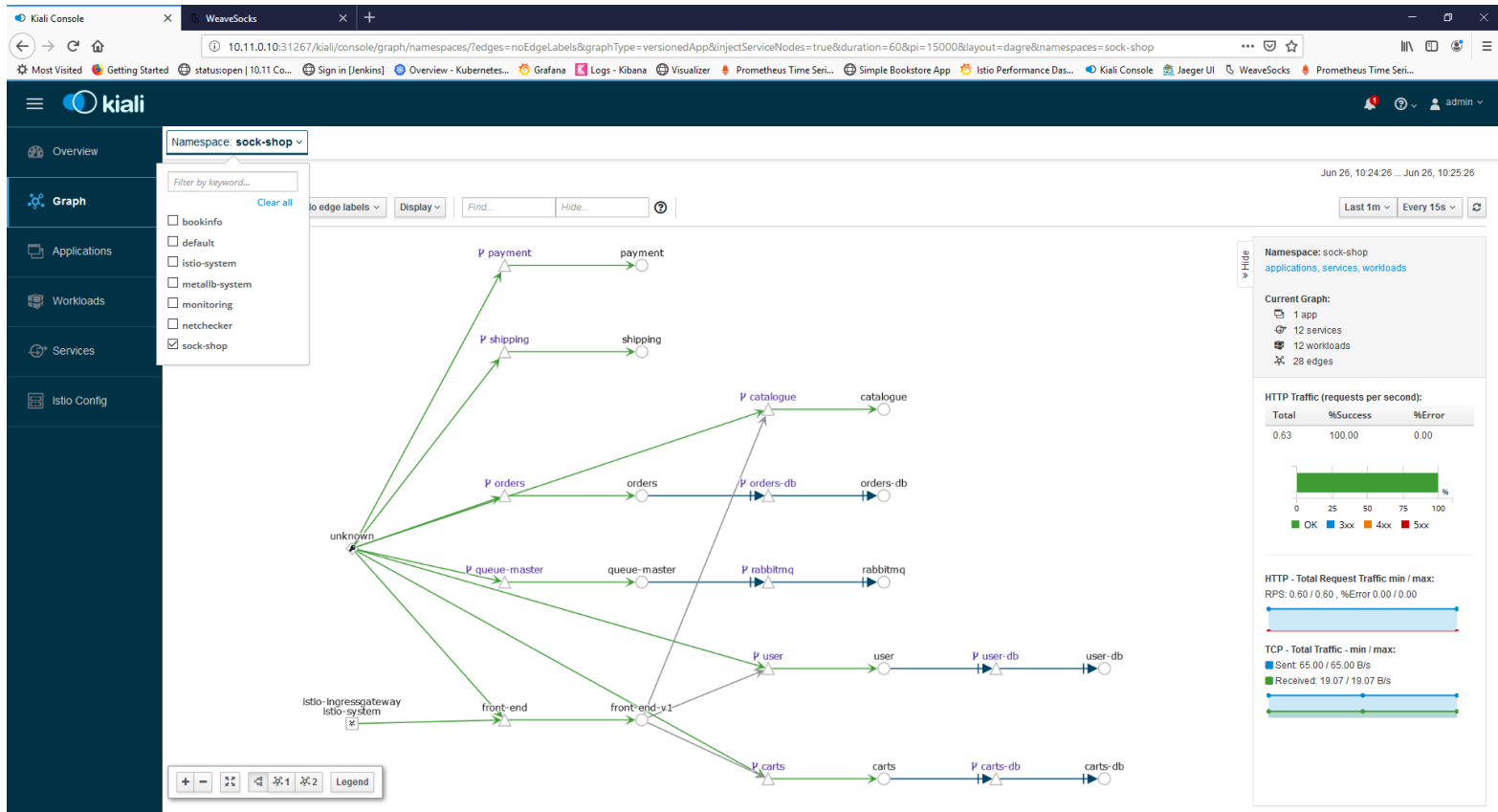
— Reviewer2

★★★☆☆

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Istio Fundamentals (IST50)	New! Introduction to Istio & Service Mesh	1 day
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Thank You!

Q & A