

Tutorial

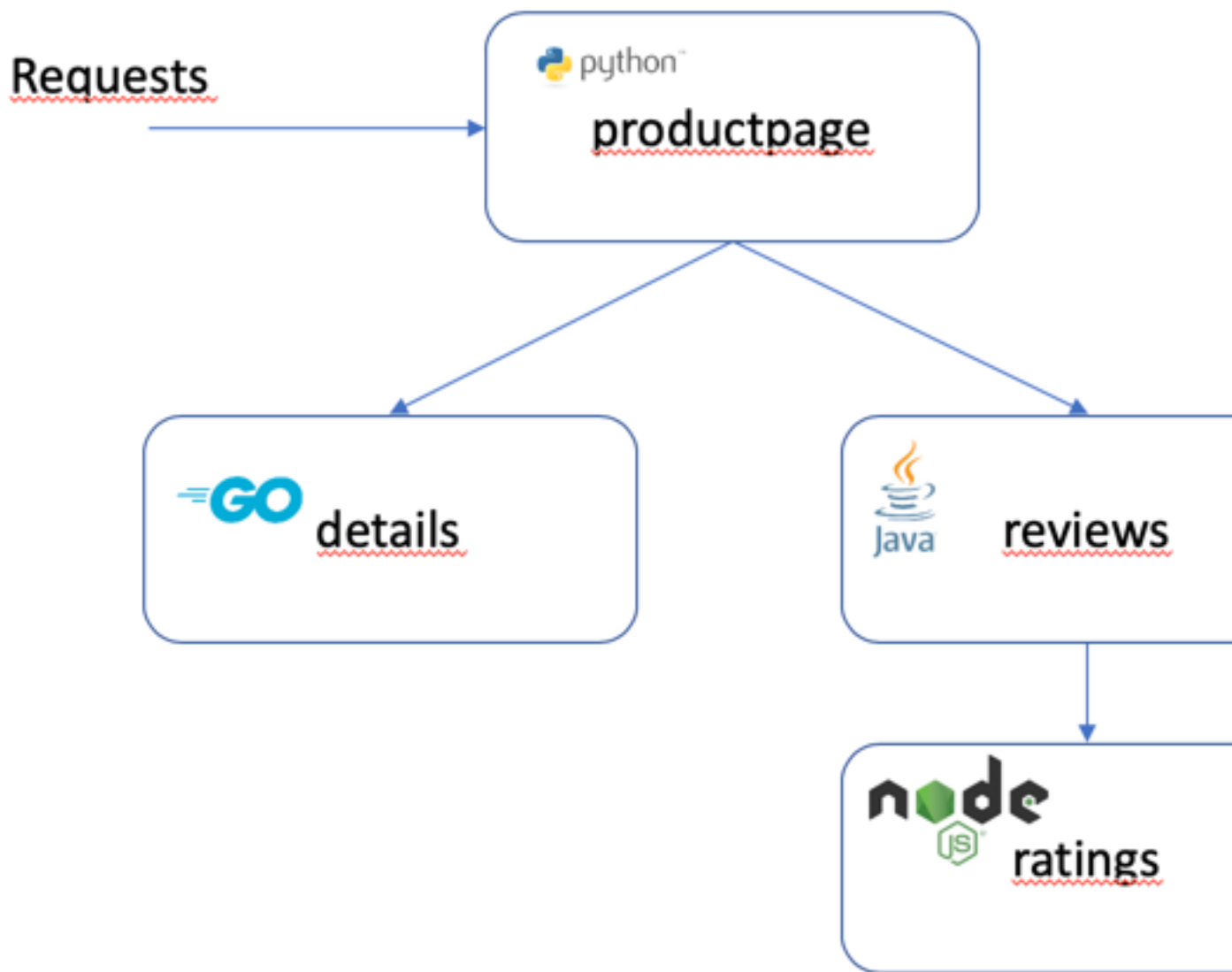
Companies are modernizing their applications, preparing to move them to the cloud. In this process, applications are refactored to use a microservice architecture and deployed in dynamic environments like Kubernetes. Cloud-native development is way more agile than traditional methodology, which enables changes to application structure at a rapid pace. This creates a challenge for Operation teams who must maintain those applications and provide high availability of the services. With a new version of application deployed daily or weekly, there is rarely time to create bespoke monitoring dashboards and practice the troubleshooting routines. Both people and tools have to adapt to new conditions.

IBM Cloud Pak for Multicloud Management can manage Kubernetes clusters that are deployed on any target infrastructure - either in your own data center or in a public cloud. IBM Cloud Pak for Multicloud Management includes IBM Cloud App Management to simplify monitoring your applications across any cloud environment.

IBM Cloud Pak for Multicloud Management helps companies make the transition from traditional monitoring systems to cloud-based ones more easily. It effectively monitors all kinds of IT resources in a hybrid environment. It helps Operation teams manage hybrid environments without hiring new personnel to support each new technology that is being used by developers.

In this tutorial, you learn how to use IBM Cloud Pak for Multicloud Management to monitor and manage the application availability with a "Golden Signal" approach to monitoring your applications. This approach focuses on Latency, Errors, Traffic, and Saturation (for a quick introduction, see [Simplify Application Monitoring with SRE Golden Signals](#)).

The sample Bookstore application is provided in the environment. It represents a modern, microservices-based application installed in a Kubernetes cluster. The diagram below shows the architecture of the application.



As a Site Reliability Engineer, you will explore how, instead of being overloaded with dozens of metrics that are captured from monitored resources, IBM Cloud Pak for Multicloud Management highlights the most important ones. These consolidated metrics indicate the health of the service and help you effectively resolve availability issues.

In this tutorial, you will explore the following key capabilities:

- How to navigate IBM Cloud Pak for Multicloud Management user interface to find relevant service information
- How to use Golden Signals presented for each monitored service
- How to easily resolve incidents that are related to service availability by using runbooks

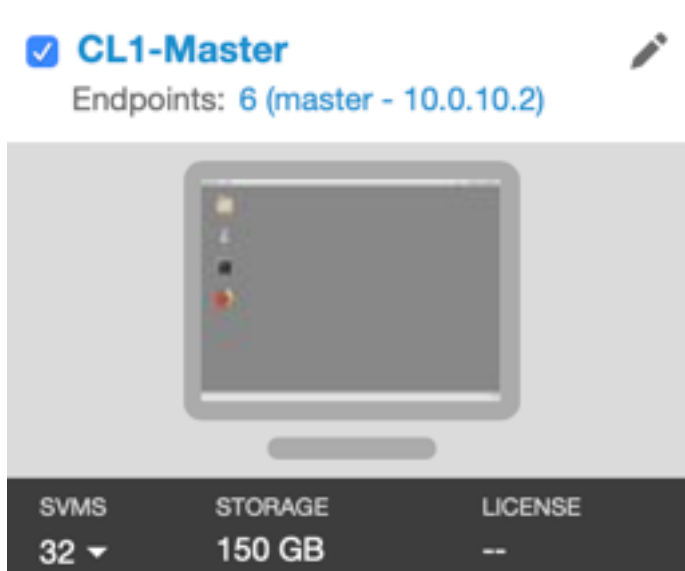
Let's access the desktop

Follow the instructions on the right to provision the lab environment.

If the environment is not started automatically, click the play button in the upper right to start all four virtual machines. This takes approximately 15 minutes.



Click **CL1-Master** to access the desktop of the server



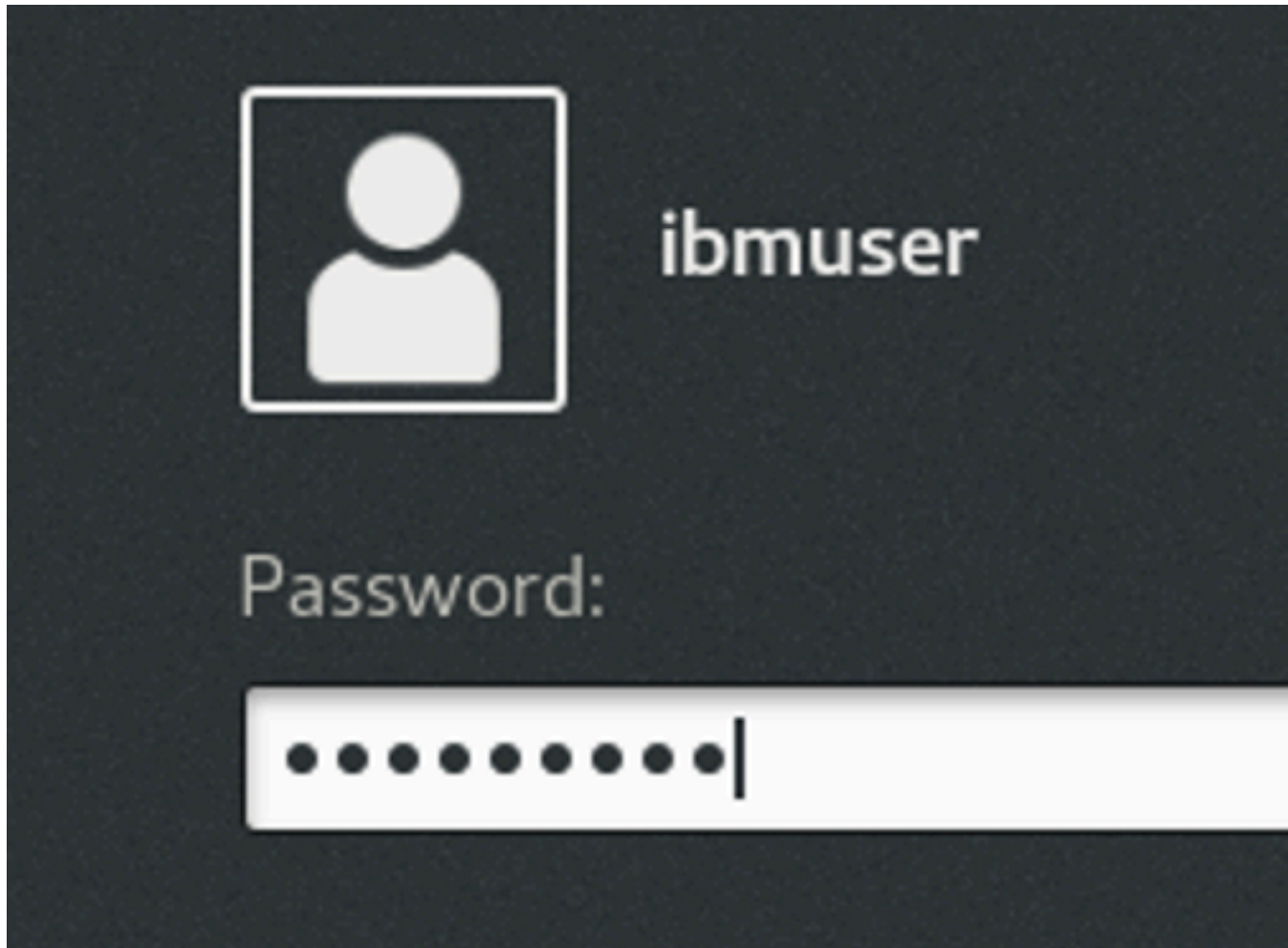
A Linux desktop appears in your browser tab. Feel free to resize the window for a better view.



Access the IBM Cloud Pak for Multicloud Management user interface

In this section, you verify the startup process and prepare the environment for the following exercises. Let's login to desktop and start the IBM Cloud Pak for Multicloud Management user interface

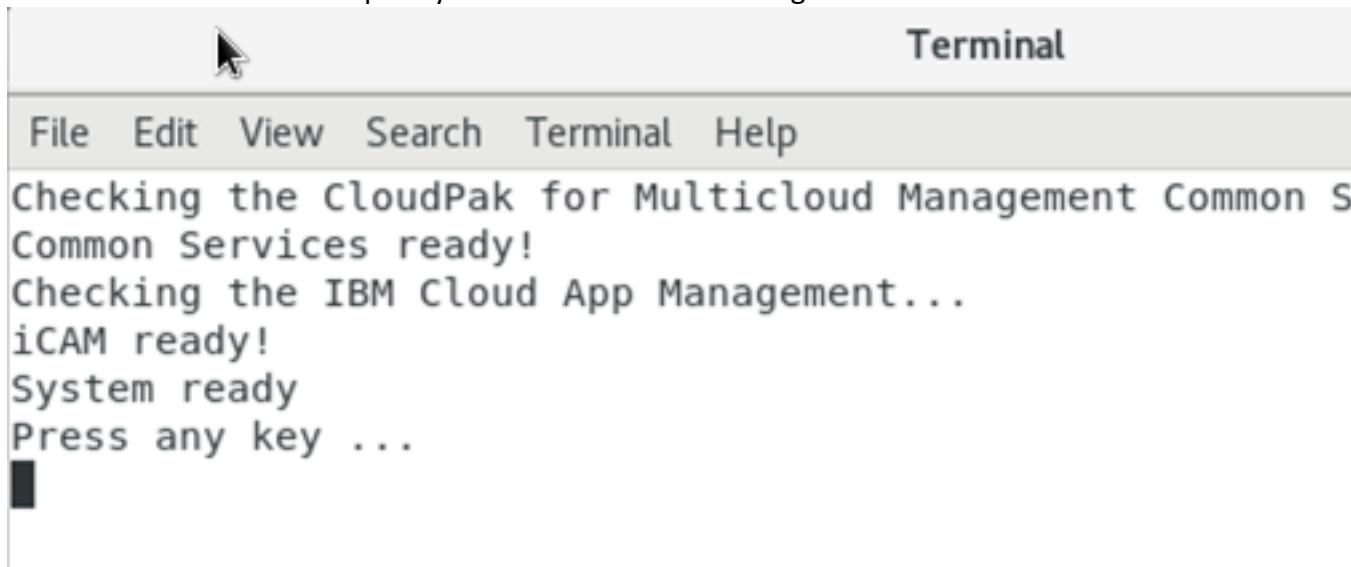
1. Log in as **ibmuser** using '**engageibm**' as a password.



2. Verify that the environment was fully initialized.

On the desktop, you should see an icon named "**Verify readiness**". Double-click on the icon to run the verification script that checks if the environment was fully initialized. In

the terminal window that opens you should see the following text:

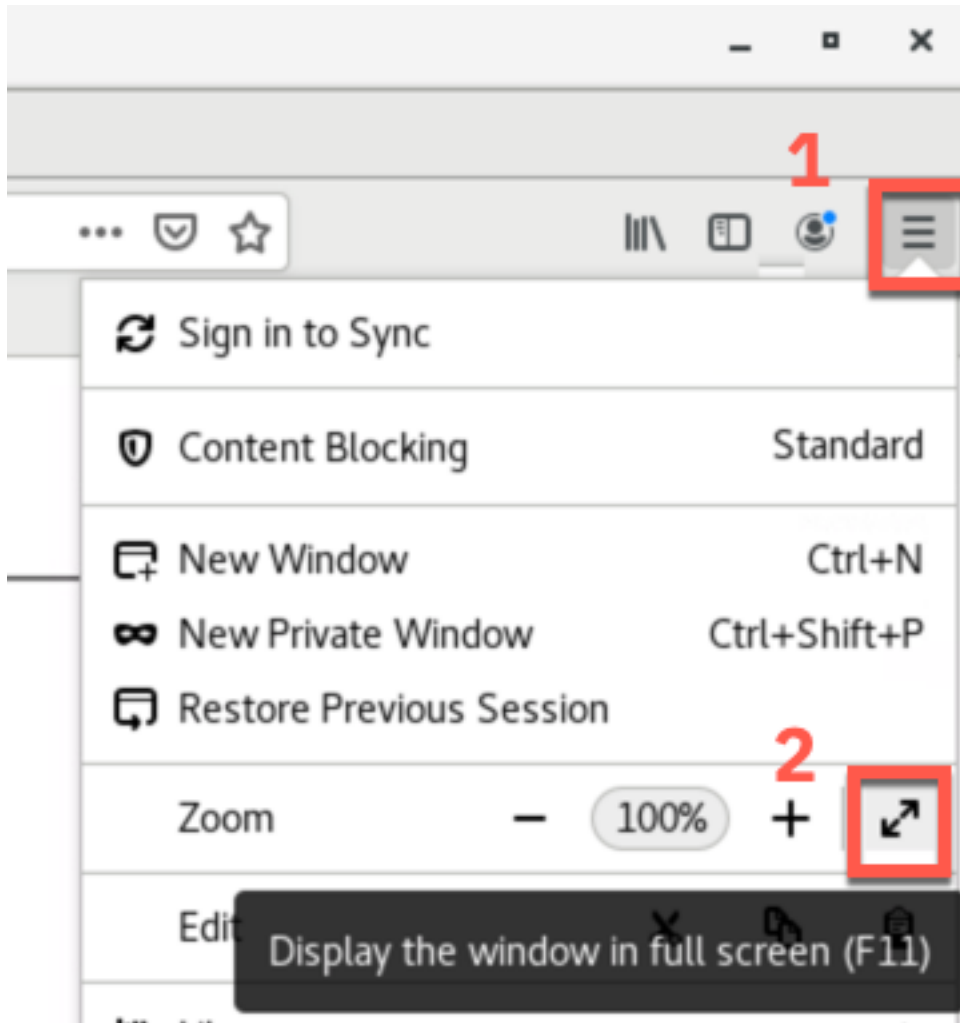
A screenshot of a terminal window. The title bar at the top says "Terminal". Below the title bar is a menu bar with the options "File", "Edit", "View", "Search", "Terminal", and "Help". The main area of the terminal displays the following text: "Checking the CloudPak for Multicloud Management Common S", "Common Services ready!", "Checking the IBM Cloud App Management...", "iCAM ready!", "System ready", and "Press any key ...". A black cursor is visible on the line "Press any key ...".

```
Terminal
File Edit View Search Terminal Help
Checking the CloudPak for Multicloud Management Common S
Common Services ready!
Checking the IBM Cloud App Management...
iCAM ready!
System ready
Press any key ...
█
```

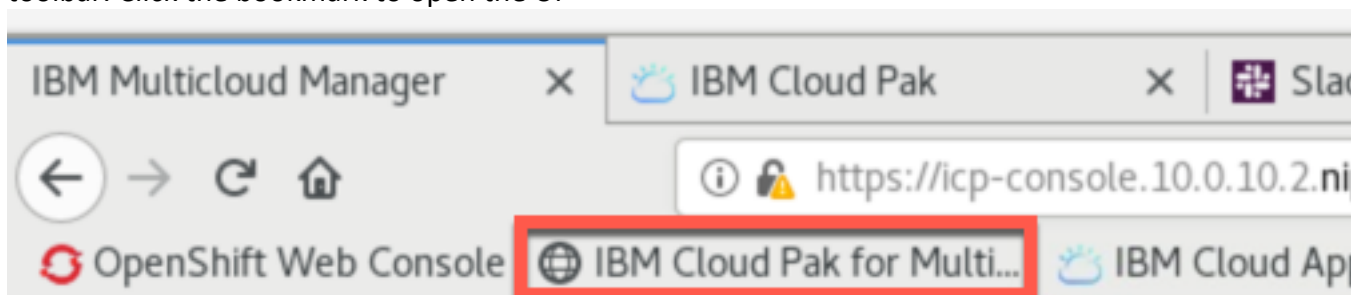
If the environment is not ready, wait until the "System ready" message is displayed. **DO NOT** run the "Start Scenario" script yet.

3. Start the Firefox browser (link is on the desktop). It is not recommended to refresh Firefox, as this may change the tested lab behavior. However, if you do refresh Firefox, you may need to show the Bookmarks Toolbar to find the links mentioned in this tutorial (it may be hidden after upgrade).

For better viewing, switch the browser in the virtual machine into the "Fullscreen" mode



4. The link to the IBM Cloud Pak for Multicloud Management is added to the Bookmark toolbar. Click the bookmark to open the UI



HINT: At any point during the lab, if you are lost navigating in the Cloud Pak UI you can click the link again to return to the main product screen.

5. If not already logged in, log in as **admin** with a password of **Passw0rd!**

IBM Cloud Pak for Multicloud Management

Fast. Flexible.
Intelligent. Open.
Enterprise-grade.

Log in to your account

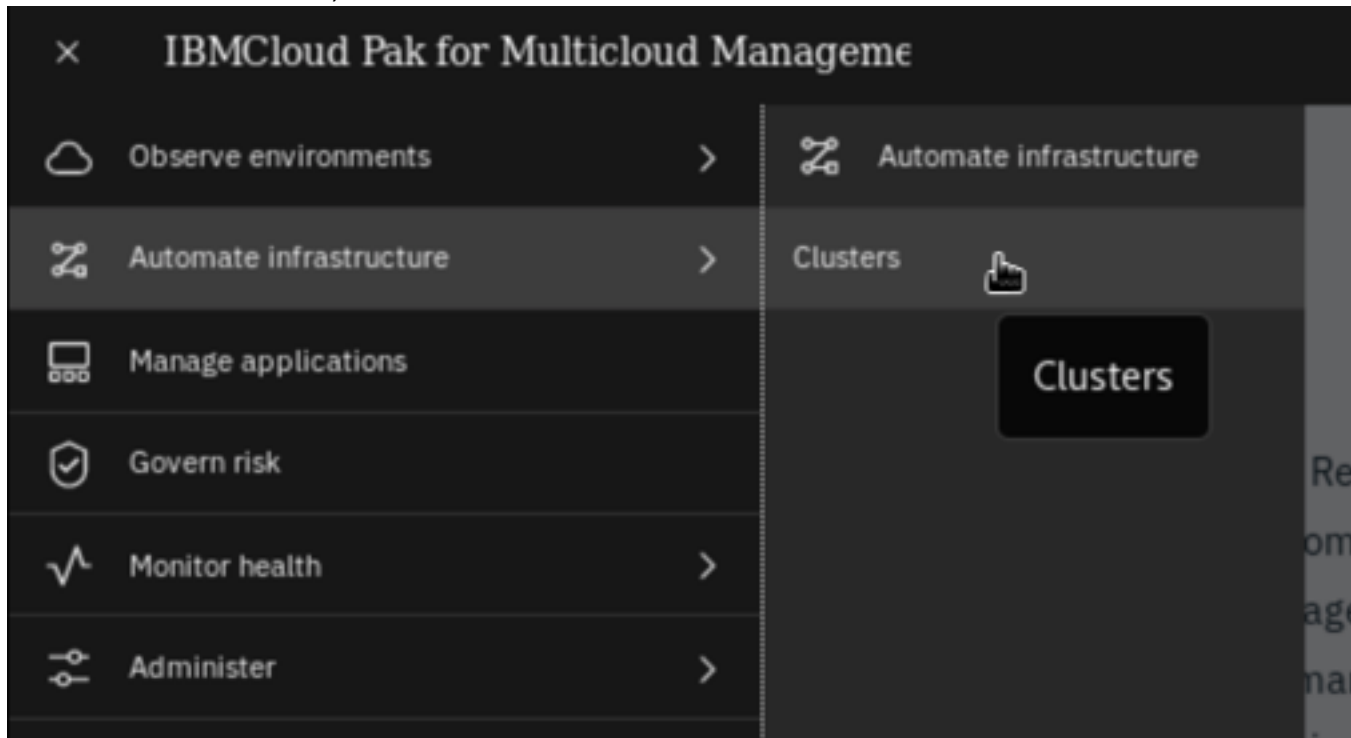
Username

Password

Log in

Maximize the window, if not already maximized.


6. Upon successful login, open the "hamburger" menu in the upper-left corner, select **Automate infrastructure**, and then **Clusters**.



7. In the Clusters view, select the "..." sign on the right (it shows up when you hover your cursor over it) and select **Edit Labels**.

Clusters

 Find

Name	Namespace	Status	Nodes	Kubernetes version
local-cluster	local-cluster	 Ready	3	3.3.0

Items per page 20 | 1-1 of 1 items

Edit labels

Launch to cluster

Logging

Monitoring

Incidents

Find cluster

8. On the Manage labels dialog, click the row containing "environment=Dev", change the Dev value to Demo, click the check icon, and save the changes.



Manage labels

Add a label

= 

 Search

cloud=Other 

environment=Dev 

name=local-cluster 

region=US 

vendor=OpenShift 

Cancel

Save

Q Search

cloud=Other ×

environment = Demo ✓ **2**

1

name=local-cluster ×

region=US ×

vendor=OpenShift ×

3

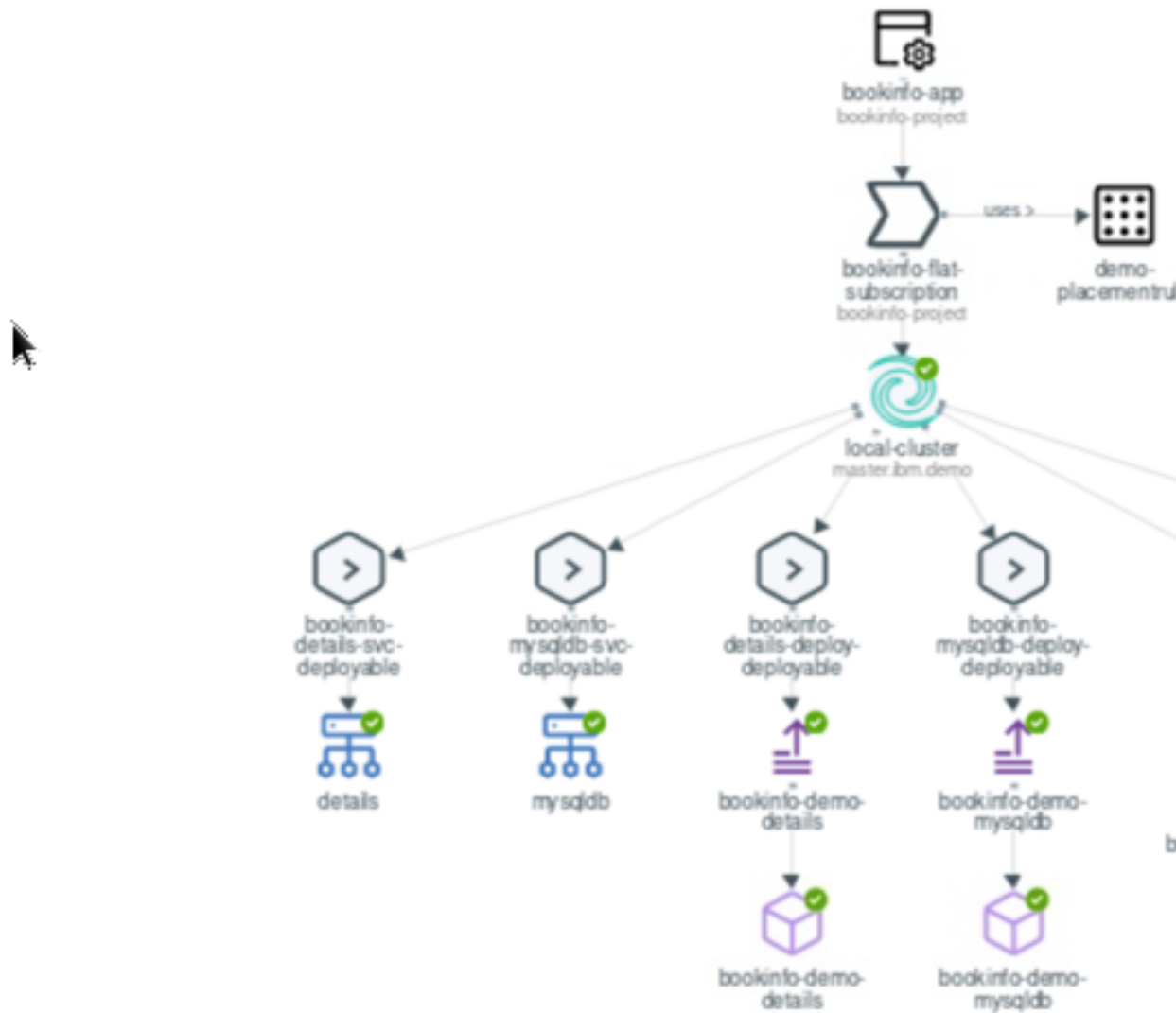
Cancel Save

9. This change activates the deployment of the sample Bookinfo app on the local-cluster. To learn more about deploying applications with IBM Cloud Pak for Multicloud Management, visit [Application Management](#) hands-on lab.
10. To observe application being deployed, select the menu in the upper-left corner, then select, **Manage applications**, and select the **bookinfo-app** from the list.



After a while, you should see the application topology with the green marks, meaning

that component was successfully deployed.



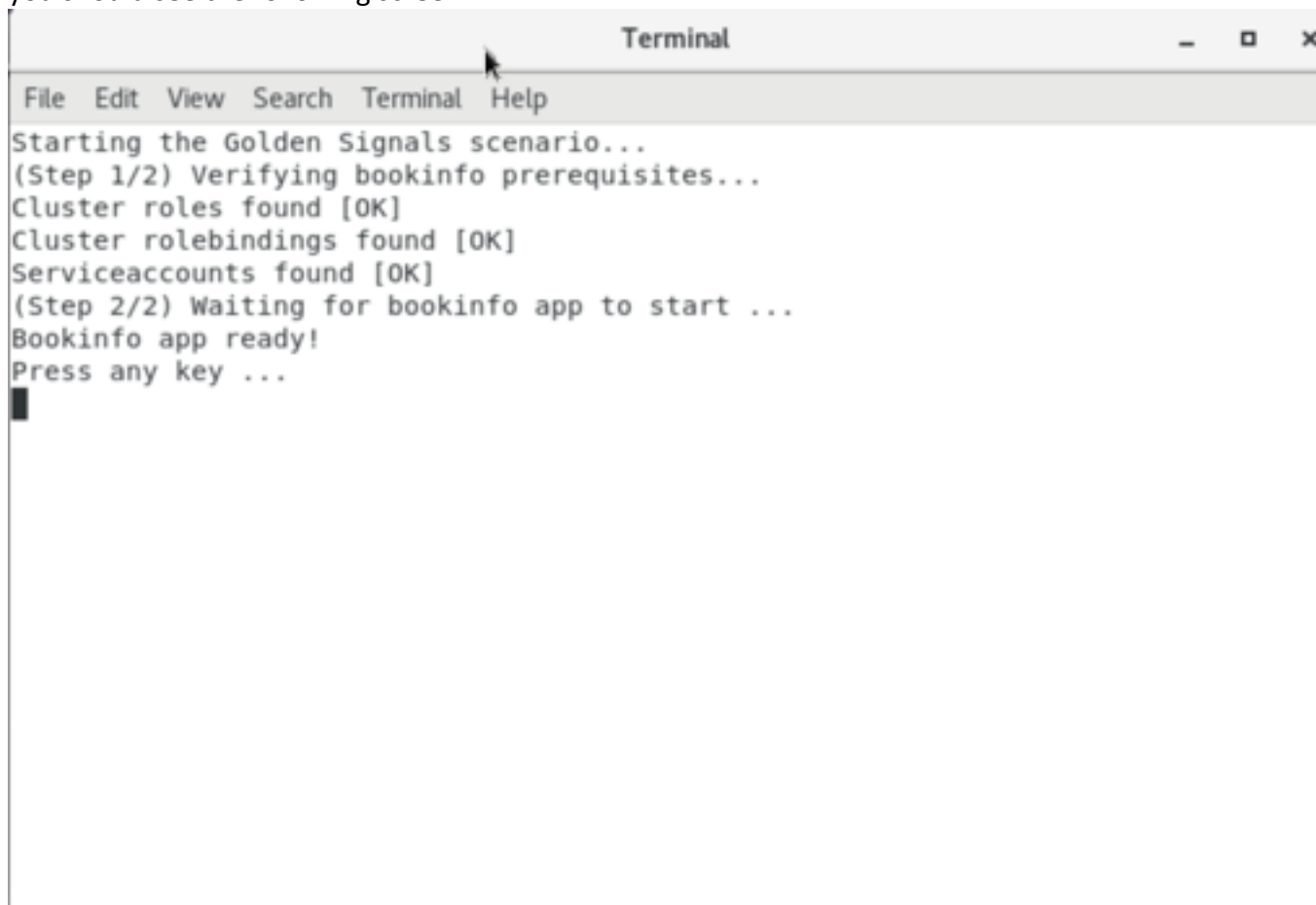
11. If you cannot see the local-cluster icon, double check if you correctly edited the label in step 8 above. If you see the icons but no green marks, open the terminal (link is on the desktop) and check if all the klusterlet pods are running with the following command:

```
oc get pods -n multicluster-endpoint
```

In case some pods are in Error state, delete them with "oc -n multicluster-endpoint delete pod <pod name>"

12. When the application is successfully deployed (you can also confirm with the command "oc get pods -n bookinfo"), run the "Start Scenario" script on the desktop. In response,

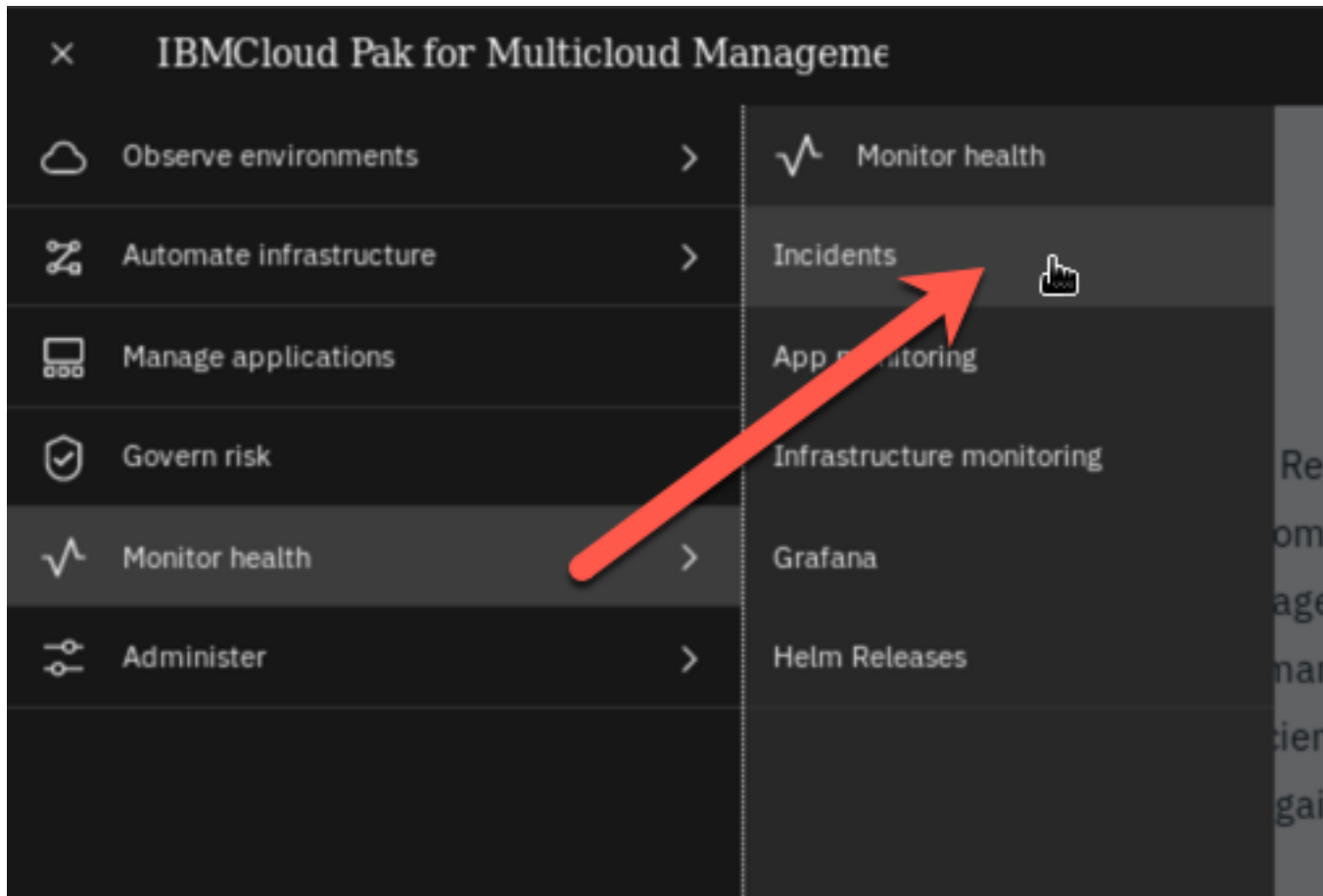
you should see the following screen.

A screenshot of a terminal window titled "Terminal". The window has a menu bar with "File", "Edit", "View", "Search", "Terminal", and "Help". The terminal output shows the following text:

```
Starting the Golden Signals scenario...
(Step 1/2) Verifying bookinfo prerequisites...
Cluster roles found [OK]
Cluster rolebindings found [OK]
Serviceaccounts found [OK]
(Step 2/2) Waiting for bookinfo app to start ...
Bookinfo app ready!
Press any key ...
```

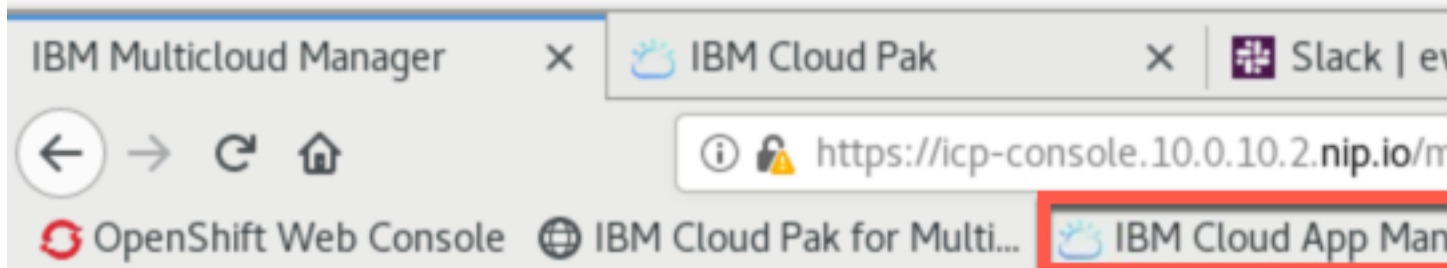
A black cursor is visible on the line "Press any key ...".

13. To open the monitoring interface, select the "hamburger" icon in the upper-left corner, and then select "Monitor health" and "Incidents".



HINT: If you can see only "**Grafana**" and "**Helm Releases**" under "**Monitor Health**" it means service discovery has not picked the new services yet (it runs every 2 minutes). Wait for 2 minutes and refresh the browser (or close and reopen).

For convenience, the IBM Cloud App Management user interface is also bookmarked and is directly accessible from the Firefox toolbar. You can click the link named "IBM Cloud App Management" at any time to return to the main monitoring view.



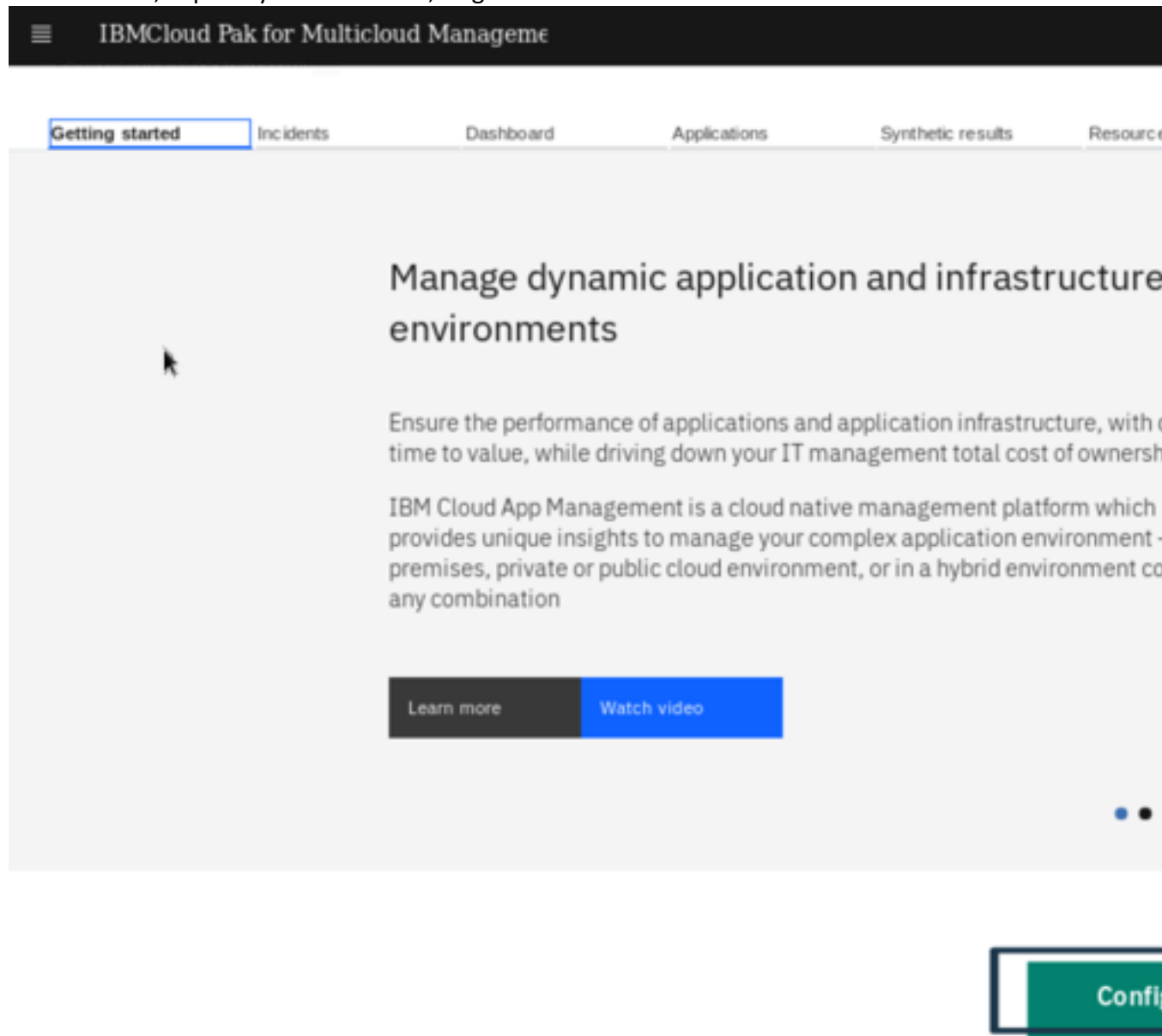
Exploring the user interface

IBM Cloud Pak for Multicloud Management provides multiple views that are designed for different user roles. In the next few steps, you learn how to effectively use these different views. The exploration time will also allow for failure events to be generated so you can then diagnose the situation. Start

1. Click **Getting started** tab.

Start with the **Getting Started** page where you'll see several options. At the top of the page, you will see several other tabs. Underline marks the tab that is open: you are on the "Getting Started" tab. At any time, you can select one of the other tabs to see

the Incidents, explore your Resources, or go to the Administration tools.



2. Feel free to take a quick look, and then click back on the “Getting Started” tab to continue (we’ll come back to the other tabs later).

The top half of the screen has introductory videos and instructions, the bottom half shows tasks that guide you through the process of setting up monitoring agents, defining runbooks, and more.

In this lab, you focus on investigating the availability issue by using golden signals. For exploring other tasks check out other Hands-on Labs on ibm.com/demos

3. Click **Administration** tab



Getting started

Incidents

Dashboard

Applications



Policies
Configured



Runbooks
Configured



Integrations
Configured



Metering
Configure



Thresholds
Configured



Resource groups
Configure




In this view, you can configure how the monitoring solutions operate. There are multiple tiles, representing the different aspects of the solution, for example:

- **Policies** let you configure how the events and incidents should be processed
- **Thresholds** let you define customer alerts for any monitored metrics
- **Synthetics** let you define automated tests against your applications to make sure they are accessible and responsive
- **Integrations** let you define additional sources of events (e.g. from 3rd party solutions already installed in the environment) as well as targets for outgoing notifications (e.g. an ITSM solution like ServiceNow)
- **Runbooks** let you define automated actions that can be triggered based on events

Do not rush! Take time to explore these options (a few minutes is needed for events to be generated). Feel free to explore other tiles as well. When done follow the tutorial.

4. When you get an alert that something is wrong, you can go directly to the incident page. Let's take a look at what you can do from that page. Click **Incidents** tab.
By default, the Incident view shows incidents that are assigned to the currently logged in user (**My Incidents**). In case, there are no incidents open, wait for 1 - 2 minutes – the synthetic monitoring agent checks the applications at regular intervals.

 IBMCloud Pak for Multicloud Manageme

[Getting started](#)[Incidents](#)[Dashboard](#)[Applications](#)[Synthetic results](#)[Resource](#)


1 incident

My incidentsGroup incidentsAll incidents

#0020-10-0Application: Bookinfo

Top resources affected 1Event types 6


Priority 1Open for 2h 8mLast changed Mar 3, 2020 | 12:34:30 PM UTC


[11 Events](#)Highest 1

You can also view **Group incidents** (incidents that are assigned to groups that you belong to) or **All incidents** by selecting the relevant tab on the top of the page. Any incident that was assigned to you either automatically by policy or manually by operators' action will be shown on **My incidents** view.

5. Get back to the **My incidents** view. Click **Investigate** link to check the details of the incident

BAssigned

B1 incident

[Investigate](#) 

Investigating the Slow Response issue

In IBM Cloud Pak for Multicloud Management, the events that were triggered by different monitoring rules (thresholds) or collected from application logs are forwarded to event management service, which processes the events, correlating them into Incidents.

There should be 1 incident in the lab system which includes 1 or more events related to application slow response time.

1. In the middle, you see runbooks that are suggested resolution procedures for the Incidents, correlated with the events that

occurred.
[Incidents](#)

Priority 1 Incident #0020-10-0

[Resolution view](#) [Events](#) [Timeline](#) [Resources](#)

Application Bookinfo
Open for 2h 14m
Owner admin
Group Operations [Assign group](#)
Status Assigned
[11 events](#)
[0 comments](#)

Recent timeline

- !

[1h ago](#)

Event #g87v-tor5
Mar 3, 2020 | 12:34:30 PM UTC
- !

[2h ago](#)

Event #ayja-5suk
Mar 3, 2020 | 12:22:03 PM UTC
- !

[2h ago](#)

Event #4b6a-nvdv
Mar 3, 2020 | 12:19:14 PM UTC

[Resolve](#) [In progress](#)

Suggested run book

Scale up slow app

Success rate: --
Rating: Not rated

2. Click the **Events** tab. Review correlated events. There may be multiple events from different sources. Some coming from synthetic monitoring agent, others coming from runtime data collectors embedded in microservices deployed in the cluster.
3. Expand the details of the event that is related to Web Application Slow response time
4. Click the link starting with **/syntheticsTest** to go directly to the specific test that triggered the alert

3 of 3 events

Correlated from **Application** Bookinfo

Sev	State	Resource type	First occurrence	Summary
1	Open	Web Application	Mar 4, 2020 12:14:29 PM U...	Slow respon

Event info

Suggested runbooks (1)

State	Location	Host name
Open	-	-
ID	IP address	Sender type
#x3jp-fdts	-	Webpage

URLs

Link

Resource dashboard drilld...

Event dashboard drilldown

<http://bookinfo.10.0.10.2.nip.io/productpage?u.../syntheticsTests/fm98HpT6RMGNHZA1BhbQ6Q.../incidents/bdb915e0-5e11-11ea-bd6a-d57775...>

>	1	Open	nodeApplicationRuntime	Mar 4, 2020 12:14:50 PM U...	Node.js_Slov
---	---	------	------------------------	--------------------------------	--------------

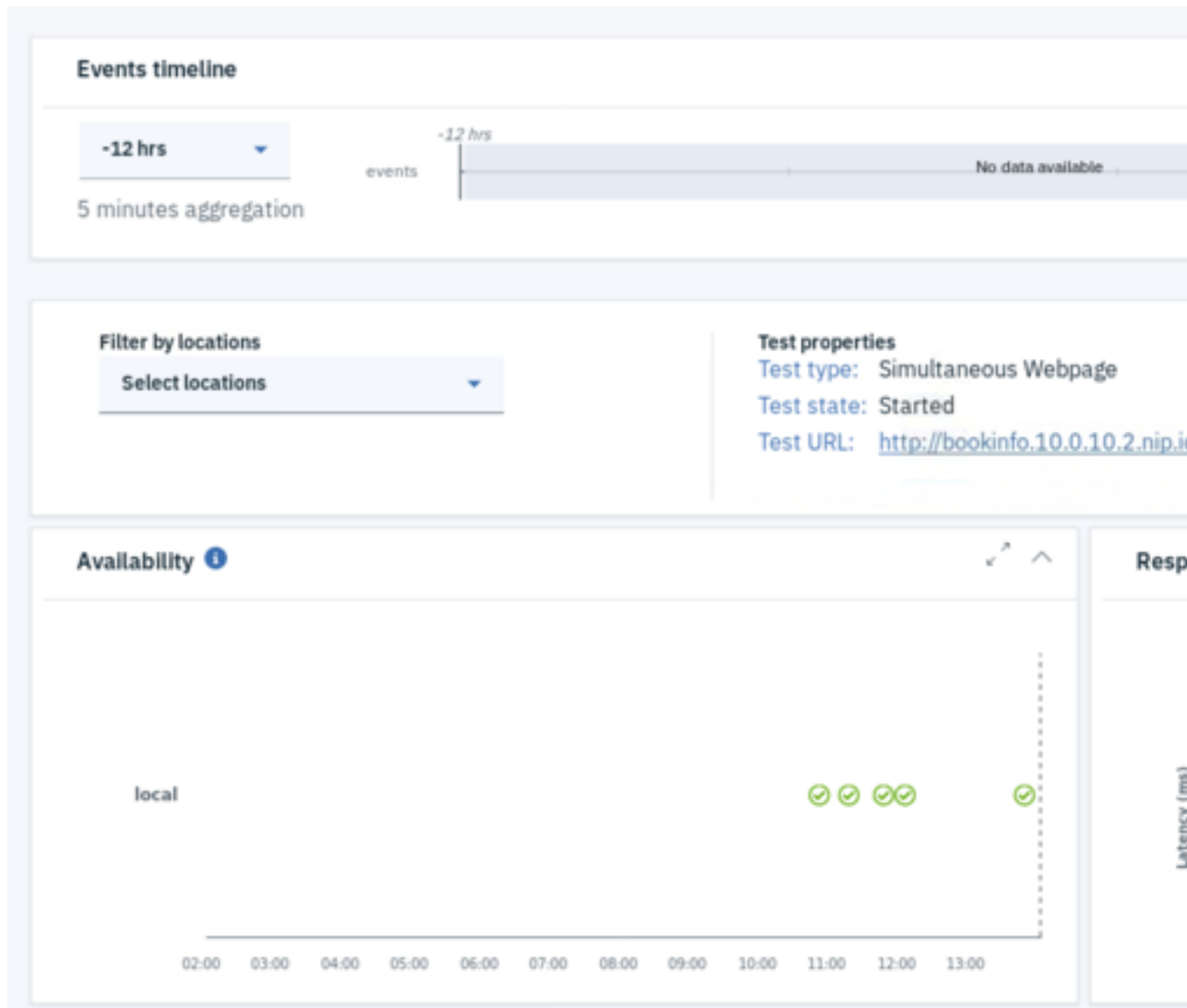
Analyzing the Synthetic Monitoring results

In this section, you learn how to use synthetic monitoring capabilities. In the current version of synthetics, you can perform multiple different test types:

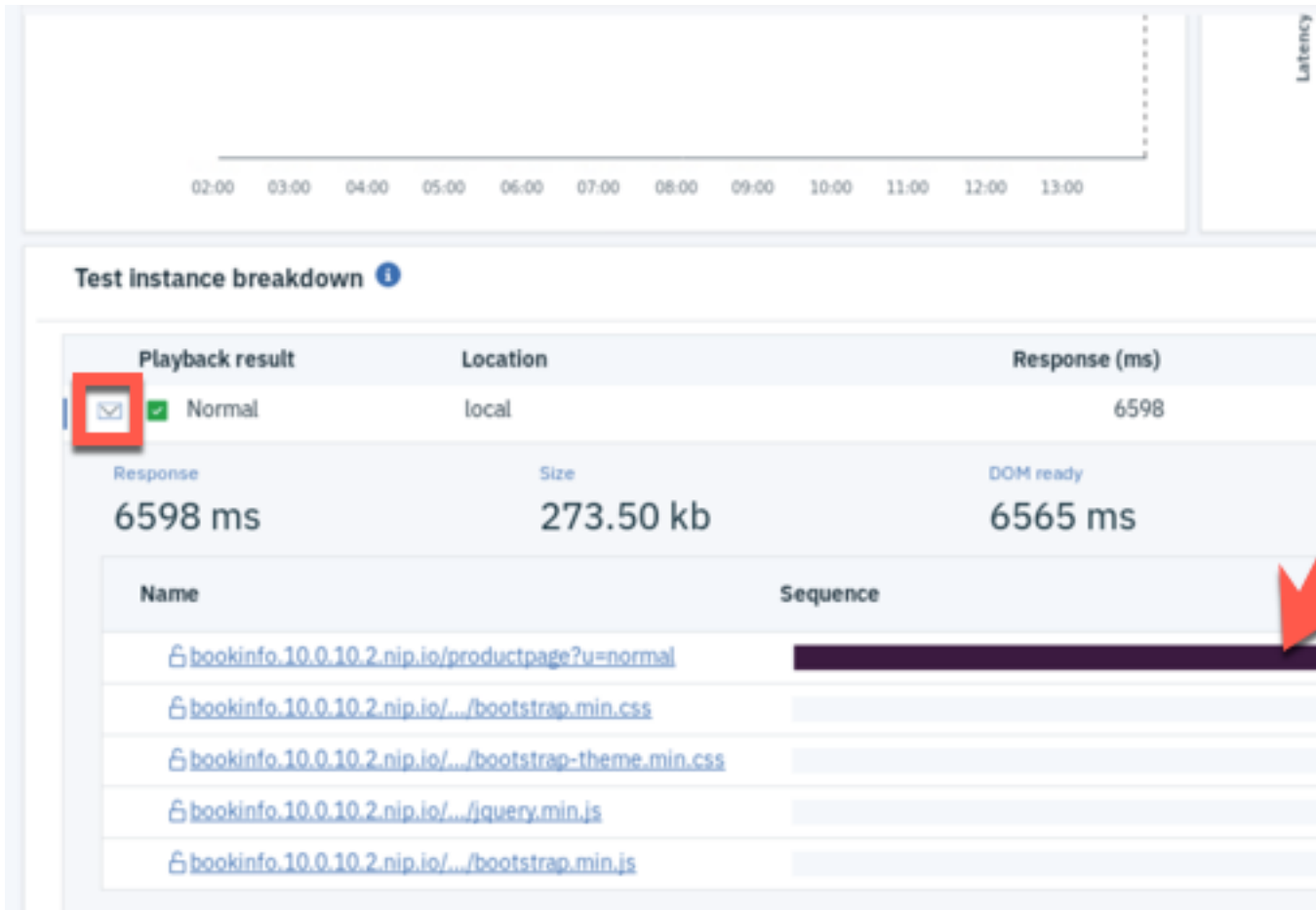
- website availability tests,
- REST API synthetic tests,
- SOAP API synthetic test
- scripted REST API synthetic tests where you can string together a series of REST requests, or
- recorded Selenium scripts.

Let's explore the Synthetic test results

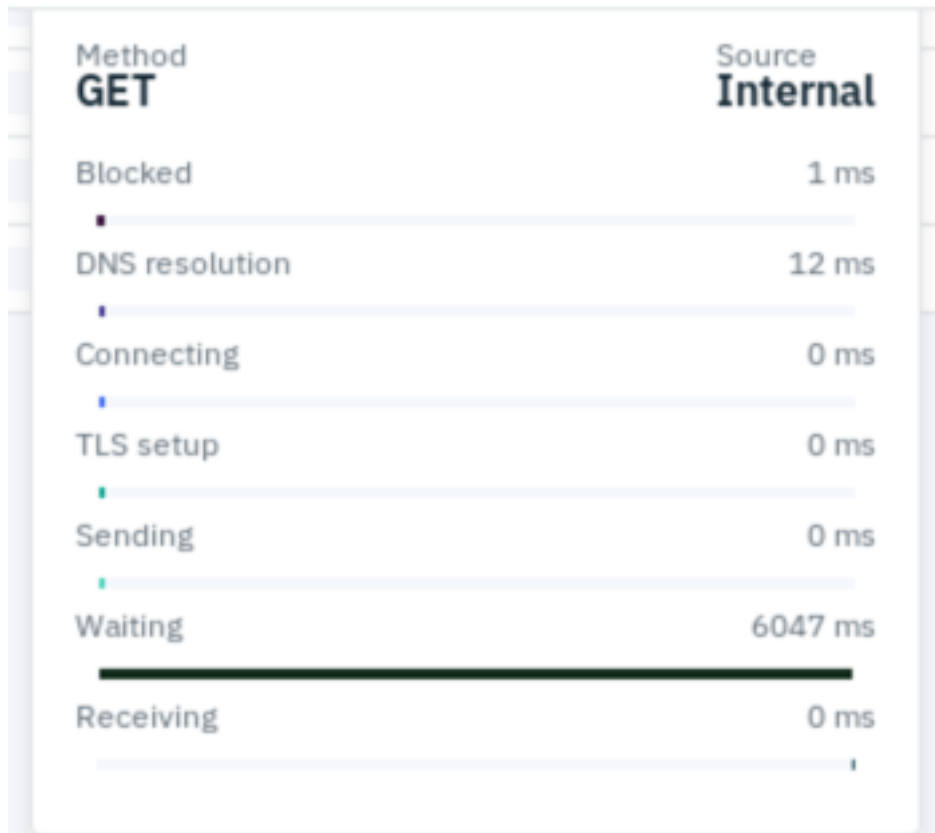
1. At the top of the screen, you see the timeline and Availability and Response Time as shown below.



2. Scroll down to see Test instance breakdown results similar to the ones shown below.
3. There are the results of each execution of a synthetic test. Click one of the '>' signs to expand the test details (if not already expanded).



You can see the details of where the synthetic test spent time gathering elements of the webpage. When you click any of the colorful bars, details of each request (DNS resolution, sending, waiting, etc.) are shown as below



From these results, you see that slow response was not caused by DNS or TLS setup but it is just a result of the server-side slowly responding to requests. Let's move then to the **Resource** view to see what is happening at the server-side.

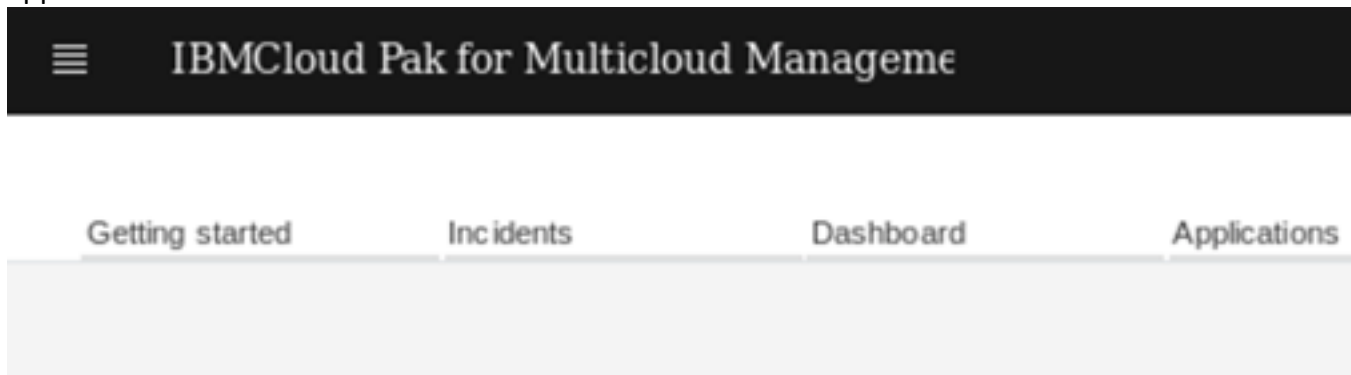
Analyze Golden Signals for services

In this section, you look for the root cause of the slow response issue by using Golden Signals views provided by IBM Cloud App Management.

Golden Signals is a modern approach to monitoring which allows one to quickly triage the issues based on the four parameters of the service: **Latency, Errors, Traffic, and Saturation**.

The golden signals focus on the user perspective and allow to display the MOST important metrics regardless of the application technology used.

1. Go back to the main view and click the **Resources** tab. For convenience, the Bookinfo resource group was created, which gathers the resources that are related to Bookinfo application



2. Click the **Resource groups** tab



3. Click the Bookinfo group and then the **productpage** service



Resource groups

^ Favorites (0)

^ All resource groups

Name	Description
Bookinfo	Bookinfo App related resources

Groups **10** ▼ | 1 - 1 of 1 groups

Resource

[details \(mycluster:bookinfo-app\)](#)

[productpage \(mycluster:bookinfo-app\)](#)

[ratings \(mycluster:bookinfo-app\)](#)

[reviews \(mycluster:bookinfo-app\)](#)

Resources **10** ▼ | 1 - 4 of 4 resources

4. This brings you to the details of the **productpage** service similar to the view shown below



productpage

Events timeline

-12 hrs



5 minutes aggregation

events

-12 hrs

Deployment topology

[How do I read this?](#)

Service dependencies



Pod network

Golden signals

Filter

Latency



Traffic



5. There are several elements that are shown on the page. At the top, you see the Events timeline, which allows you to navigate across the timeline and see the values of different metrics at the specific moment in time. Below it is a Deployment topology view showing the details of the deployment (container, pod, node, cluster). Moving the mouse over the different elements you can see the related events or even directly navigate to a related resource. On the right, you see the plots of the four golden signal metrics which helps to quickly assess the state of any service in any technology.
- **Latency** shows how fast the service is handling requests
 - **Errors** show if any of the requests are returning error codes
 - **Traffic** shows the level of incoming requests
 - **Saturation** shows the level of utilization and capacity of the service

The Golden Signals metrics that are shown at the service level are propagated from the data collector that is installed within the application that is targeted by the service. If the application is not instrumented, the infrastructure metrics (CPU, Memory) are shown instead.

6. On the left, there is a **Service dependency** view showing directly related service and its status. You can expand the view clicking the arrows as shown below

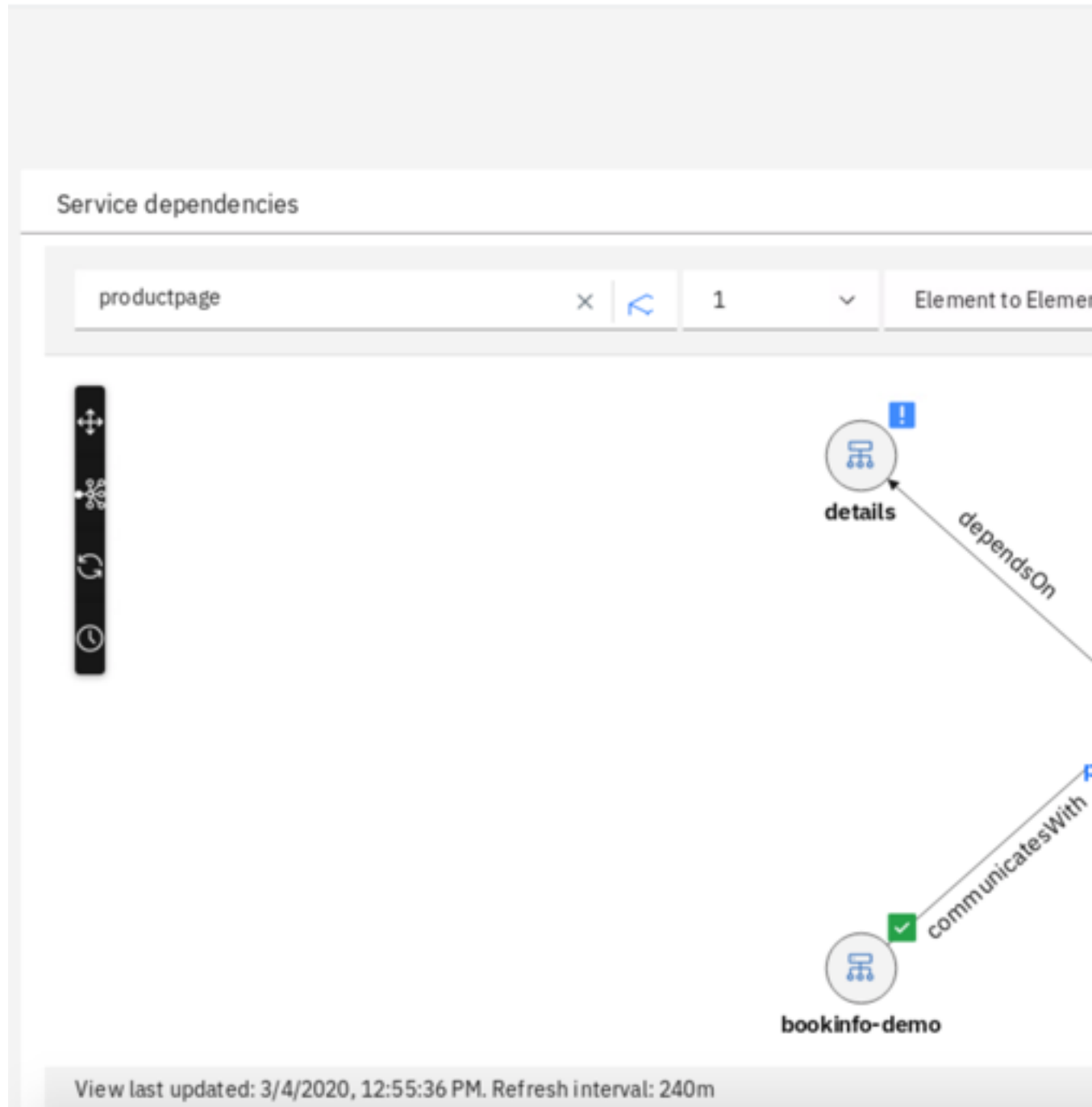


7. The service dependency view is populated based on the traffic that is captured by data collectors by using OpenTracing protocol. By default, it is showing the related services in one hop topology. Explore the available options of visualization, and when done click the **reviews** service as shown below, to navigate to dependent service to continue

the investigation.

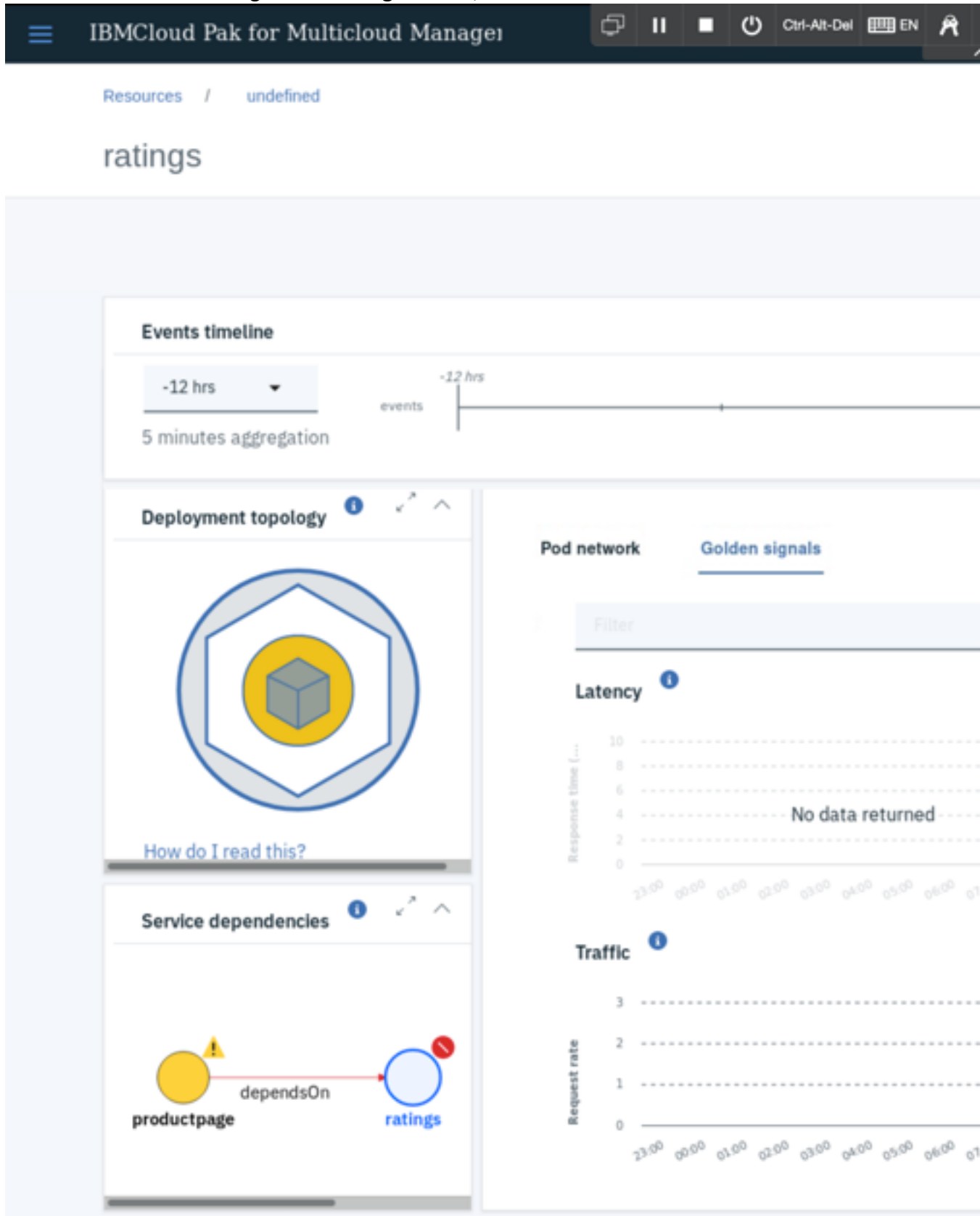
[Resources](#) / [Bookinfo](#)

productpage







8. Explore the Golden Signals for **reviews** service. Do you think it is a root cause of a slow response? Let's check the other service (**ratings**) - to open the **ratings** service details you can use the service topology view again (without expanding).

9. Let's look at the Golden Signals for **ratings** service, which should look like below:



Notice that this service is returning errors which suggests that it can be a root cause of delay. Let's check the error logs from the container.

10. To find out the pod name and target namespace scroll down the page. On the left, you see the Related resources

Related resources			
<input type="text" value="Filter"/>			
Sta...	↑	Relation	Resource
		memberOf/out	bookinfo
		communicates...	bookinfo-demo-ratings-55f69c9d6-6h2
		dependsOn/out	reviews
		dependsOn/out	productpage

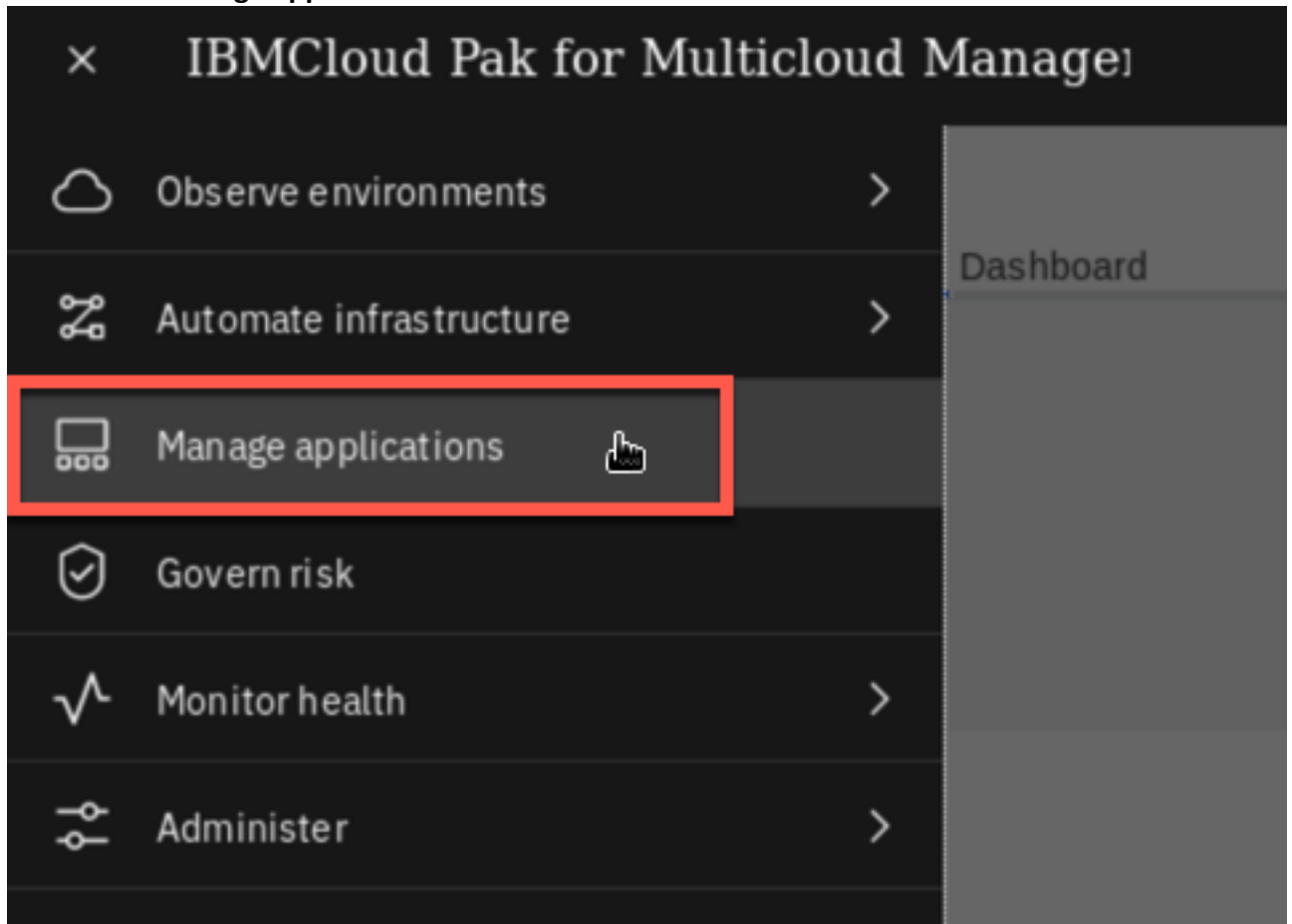
The Kubernetes Pod is named like **bookinfo-demo-ratings-xxxxxxx-yyyyy** and runs in a Kubernetes Namespace **bookinfo** in cluster **local-cluster**.

To check the pod logs we navigate the IBM Cloud Pak for Multicloud Management console.


Checking the logs and resolving the issue

In this step, you will use IBM Cloud Pak for Multicloud Management console to explore application structure, find the container that is hosting the **ratings** service, check it's error log and take action based on the findings.

1. Navigate to the application view. Select "hamburger" menu in the upper-left corner and then select **Manage applications**




2. Applications list is shown. Click the "**bookinfo-app**" application

 IBMCloud Pak for Multicloud Manage

Applications

[Overview](#) [Resources](#)

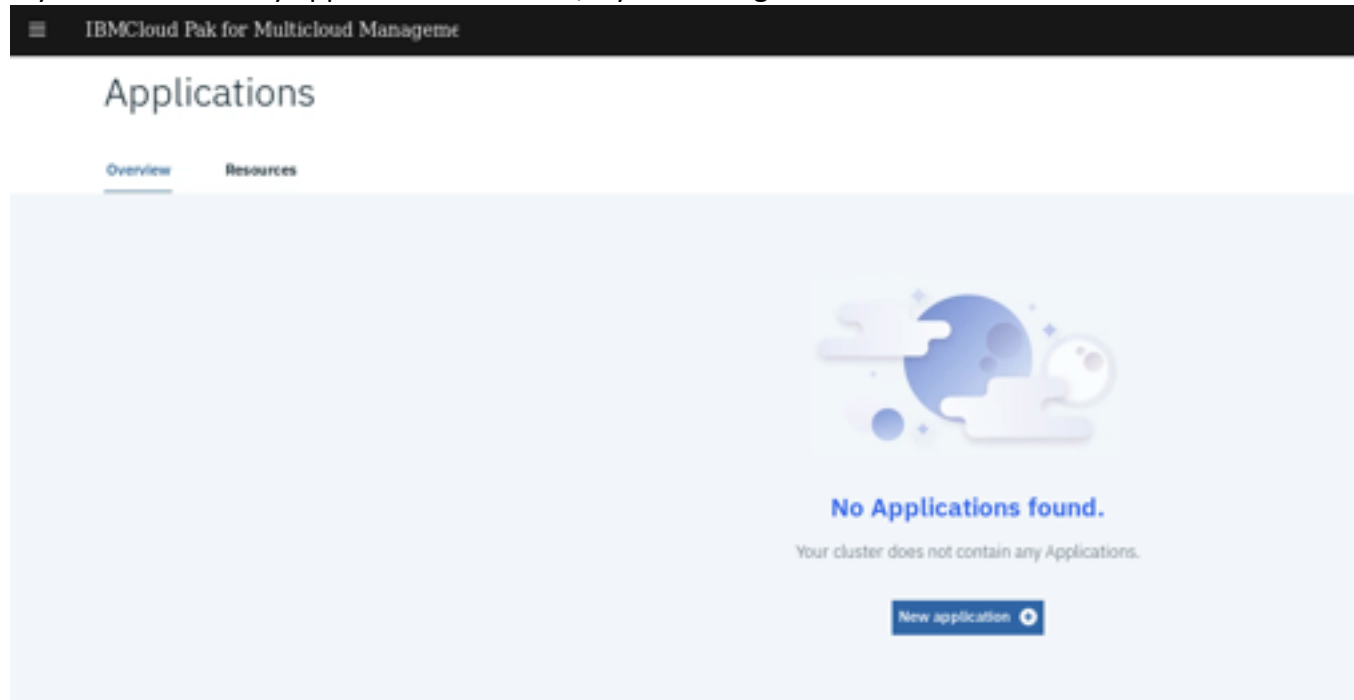
All applications (2)

 Find resources

Application name	Namespace	Managed cl
bookinfo-app	bookinfo-project	0
bookinfo-app-prereq	bookinfo-project	0

items per page **20** ▼ | 1-2 of 2 items

If you cannot see any application like below, try refreshing the browser



3. Application details view opens showing the details of the application structure.



Applications / bookinfo-app /

bookinfo-app

Overview

Resources

Incidents

Logs

Resource highlights

1

SUBSCRIPTION

On hub cluster

0 failed

0

MANAGED CLUSTERS

1 Total subscription

> [View additional details](#)

Resource topology

bookinfo-ns-channel

bookinfo-flat-subscription

!application.diagram.start.chann

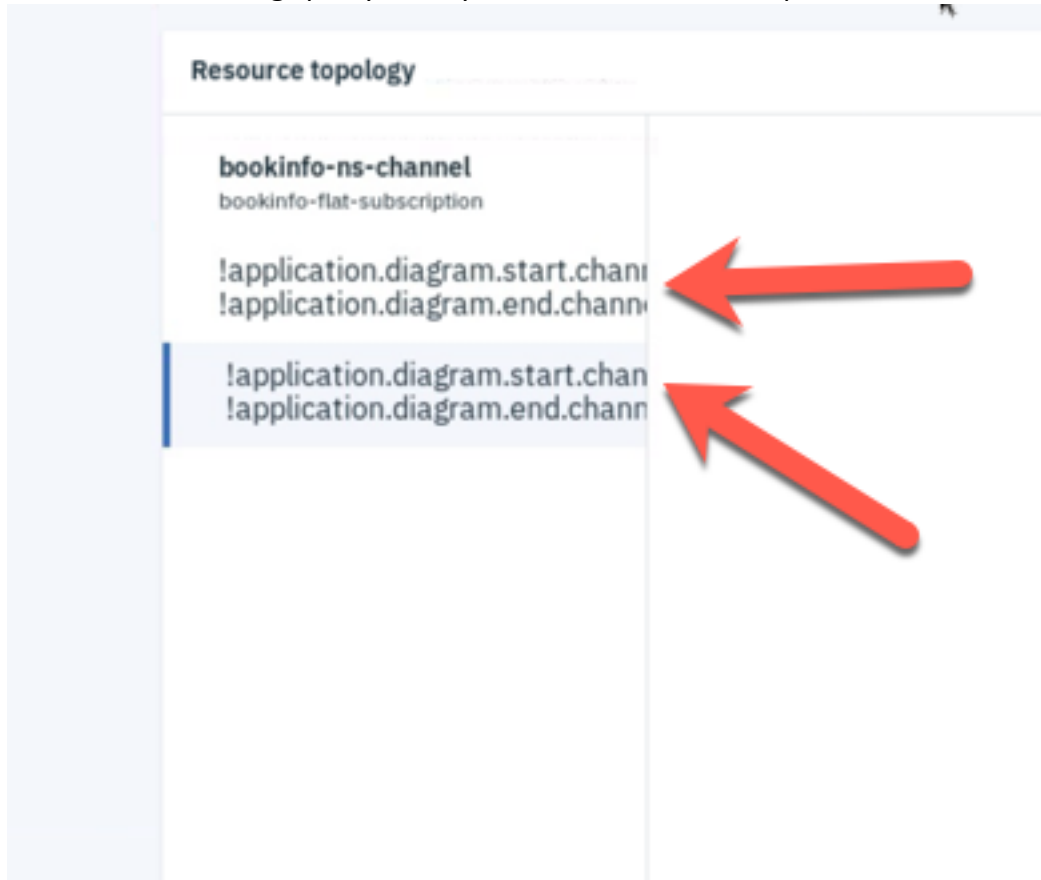
!application.diagram.end.chann

!application.diagram.start.chann

!application.diagram.end.chann



4. As the application has multiple components the view was divided into parts. If you cannot see the **ratings** pod you may need to select another part of the view.



5. On one of the parts, you should see the view similar to the one shown below

Resource topology

bookinfo-ns-channel

bookinfo-flat-subscription



!application.diagram.start.channel

!application.diagram.end.channel

!application.diagram.start.channel

!application.diagram.end.channel



application



cluster



deployable



deployment



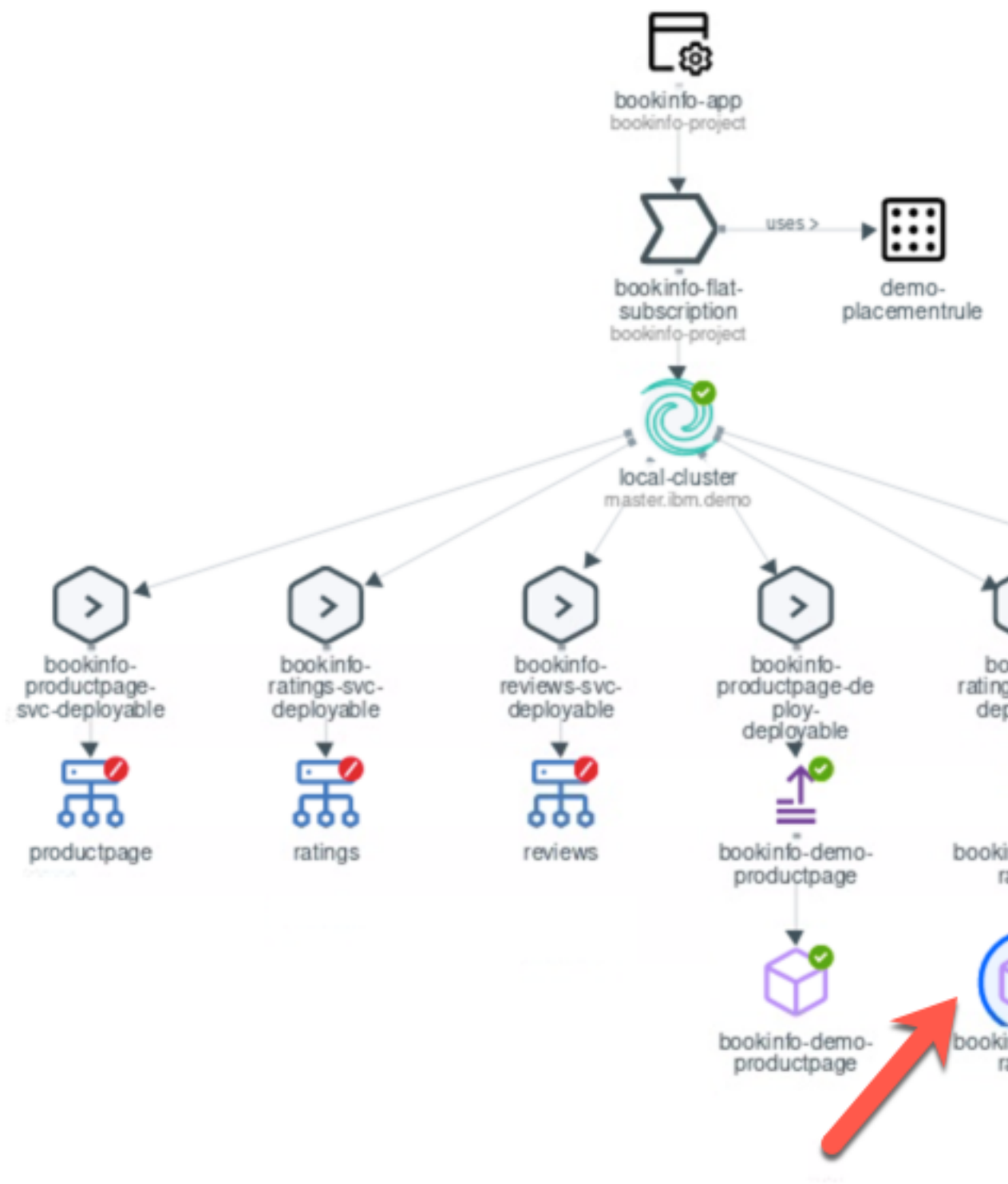
pod



rules



6. Click the **bookinfo-demo-ratings** pod name and then, in the pane that opens on the right, select **Container logs: ratings**



7. After a few seconds you should see the logs from the pod similar to the one shown below

POD

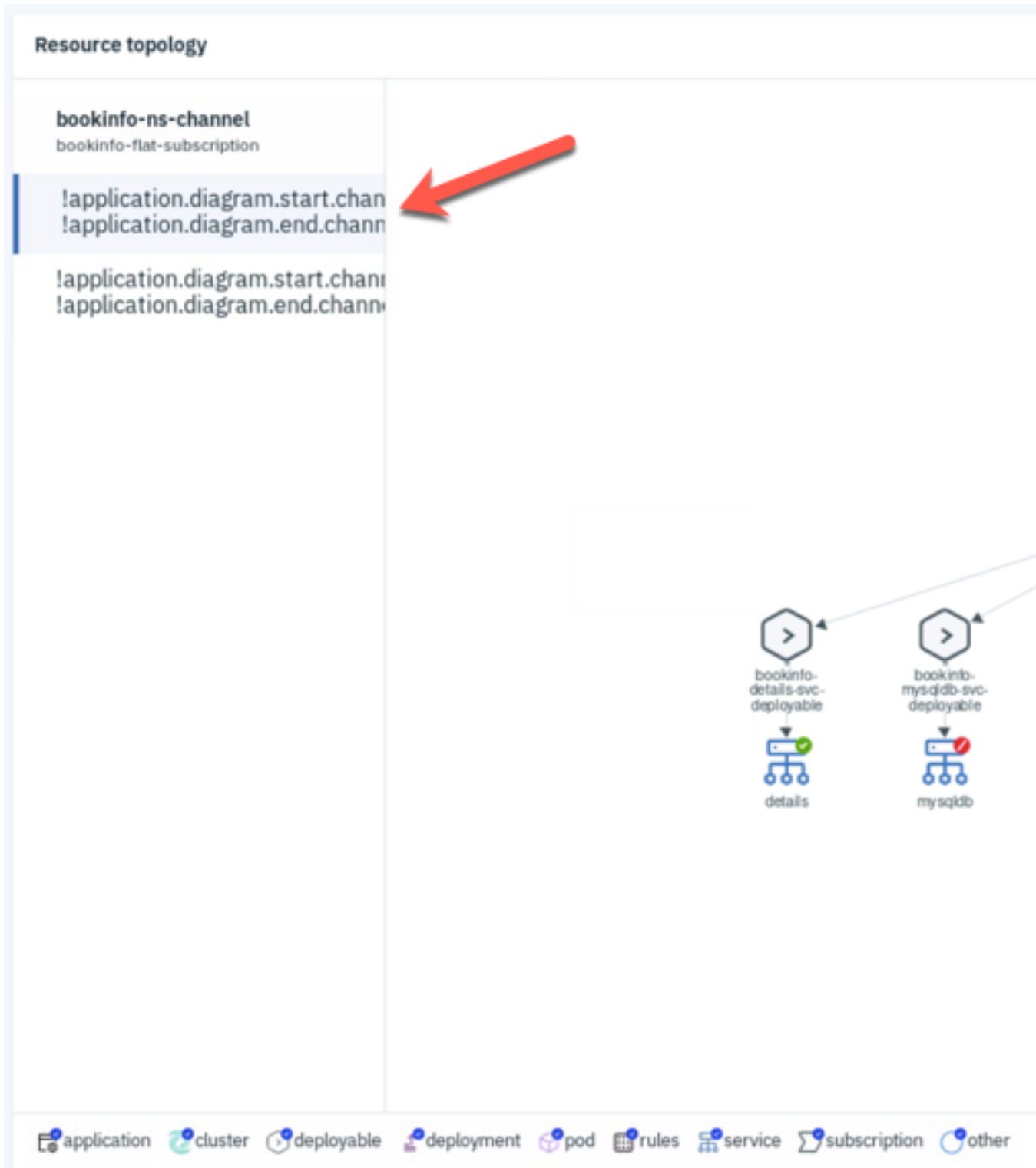
bookinfo-demo-ratings-55f69c9d6-6h2rm

ratings

```
GET /health
GET /health
GET /health
GET /health
GET /ratings/0
GET /health
GET /health
{ Error: connect EHOSTUNREACH 172.30.94.249:3306
  at TCPConnectWrap.afterConnect [as oncomplete] (net.
  -----
  at Protocol._enqueue (/opt/microservices/node_modules
  at Protocol.handshake (/opt/microservices/node_modules
  at Connection.connect (/opt/microservices/node_modules
  at /opt/microservices/ratings.js:113:18
  at /opt/microservices/node_modules/httpdispatcher/http
  at HttpChain.next (/opt/microservices/node_modules/h
  at HttpDispatcher.doDispatch (/opt/microservices/nod
  at HttpDispatcher.dispatch (/opt/microservices/node_
  at Server.handleRequest (/opt/microservices/ratings.
  at Server.args.(anonymous function) (/opt/microservi
  errno: 'EHOSTUNREACH',
  code: 'EHOSTUNREACH',
  syscall: 'connect',
  address: '172.30.94.249',
  port: 3306,
  fatal: true }
GET /health
GET /health
GET /health
GET /health
```

It seems the pod cannot connect to the database. Let's check if the MySQL pod is running.

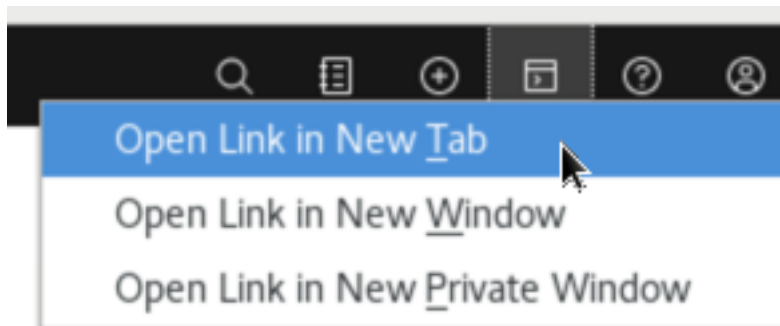
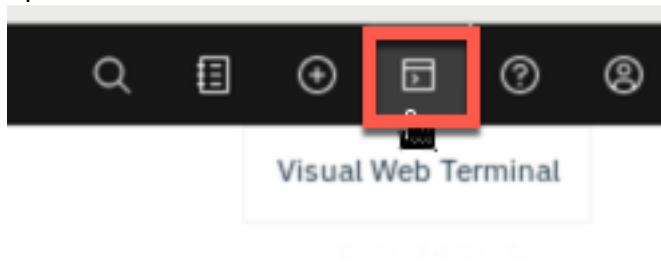
8. Select the part of the application topology that has bookinfo-demo-mysqldb pod and notice there is no small green check mark next to it



This seems to be a root cause! Let's start the pod scaling the deployment up.

9. To execute the command you need to open the terminal window. You can use the Visual Web Terminal that is embedded in IBM Cloud Pak for Multicloud Management UI. To open the terminal, right-click the icon in the upper-right corner as shown below and

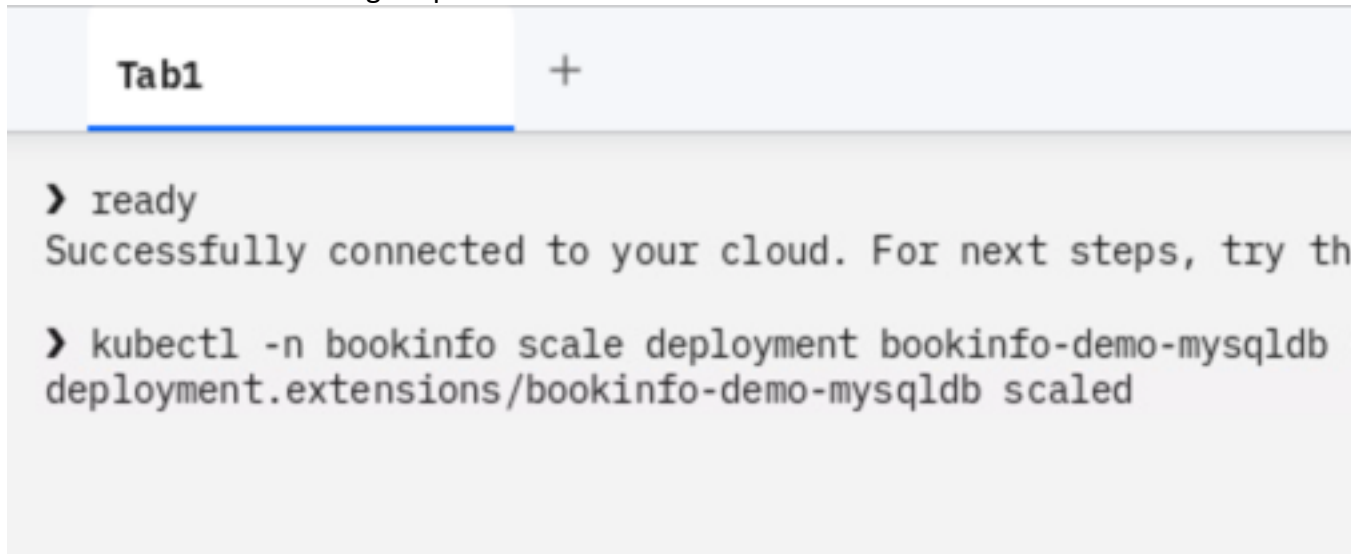
open link in new browser tab



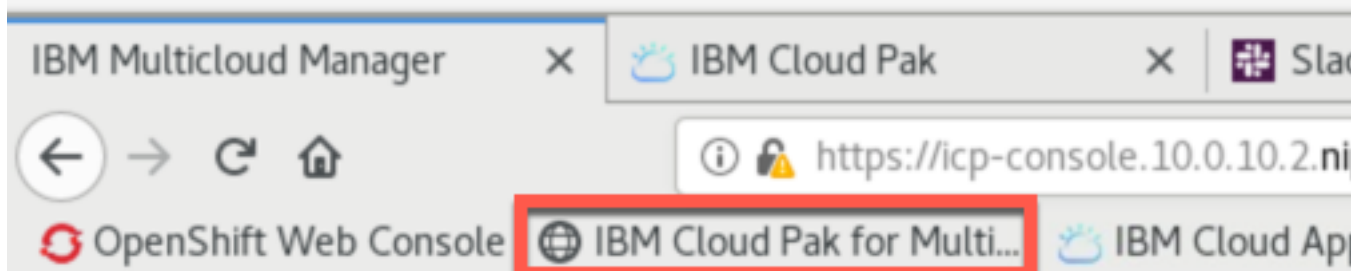
10. When the terminal connects to the cluster, run the following command: **kubectl -n bookinfo scale deployment bookinfo-demo-mysqldb --replicas=1**



You should see the following output



11. Go back to the tab showing the application topology. In case you have closed it, click the IBM Cloud Pak for Multicloud Management bookmark on the toolbar and open the Application view again (Menu-> Manage applications).



12. After a while, you should notice the green mark next to bookinfo-demo-mysqldb pod



13. Let's go back to **Incidents view** to verify that it helped resolve the issue.

14. After a few minutes, you should see that the events are cleared and that Incident status is automatically changed to Resolved and then Closed.

The screenshot shows the 'Incidents' tab in the IBM Cloud Pak for Multicloud Management interface. At the top, there are navigation tabs: 'Getting started', 'Incidents' (which is selected and underlined in blue), 'Dashboard', and 'Applications'. Below the tabs, the main content area has a light gray background. On the left, it says '1 incident'. On the right, there are two buttons: 'My incidents' (in a dark gray box) and 'Group' (partially visible). Below this, the incident details are shown: '#0018-72-0' and 'Application: Bookinfo'. Further down, there are three sections: 'Top resources affected' with an information icon, 'Event types 3', and 'Priority 1' (with a black circle containing the number 1). Below these, there are three more items: 'Duration 1h', 'Last changed Mar 4, 2020 | 1:14:50', and a link '3 Events' (underlined in blue). At the bottom, there is a section with 'Highest' (with a red circle containing a white 'X') and '1', and a link 'This incident' (with an information icon).

Summary

This concludes the tutorial in which you learned how to use IBM Cloud Pak for Multicloud Management to monitor and manage service availability using SRE Golden Signals.

- Synthetic monitoring provides easy, user's point-of-view visibility into the availability and response time of applications or services.
- Embedded runtime data collectors provide deeper metrics and troubleshooting metrics when they are needed
- “Golden Signals” normalize the most important metrics that measure the user experience, across runtimes.

To learn more, check the [product manual](#) or explore other tutorials available at <https://www.ibm.com/demos/collection/Cloud-Pak-for-Multicloud-Management/>