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#CiscoLive



The bridge to possible

# How to leverage Cisco I/Ox to host your application?

Microservices at the Networks Edge

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DEVWKS-2934



#CiscoLive



# Agenda

- Introduction
- What is IOx?
- What is a DevNet Sandbox?
- Let's prepare and install an application!
- Conclusion and Next Steps

# Introduction

# About our workshop

## We will:

- Familiarize with Cisco IOx
- Get to know Cisco DevNet Sandboxes
- Prepare, install and operate your application to IOx

## We will not:

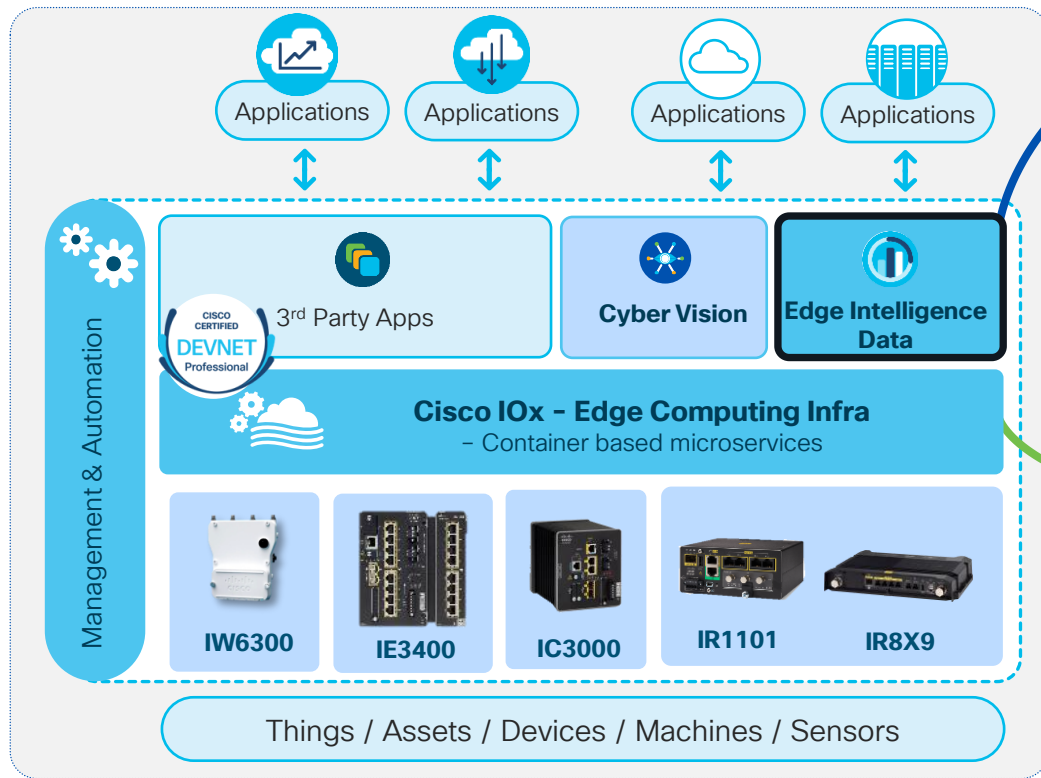
- Use an automated control-plane or build-pipeline
- Optimize the application or the application image

# Please...

- If you have questions, don't hesitate to ask!
- If you don't want to ask during the workshop, I will be around!
- If you want to exchange later: [daeckste@cisco.com](mailto:daeckste@cisco.com)
- Do not follow the guide blindly!

# What is IOx?

# Cisco IOx



{Buy}

## Get Started Fast



Using Cisco Edge Intelligence for edge data processing is the fastest and easiest way to process and send data from the edge

{Or Build}

## Your Own App



Using Cisco IOx compute infrastructure and development environment you can build your own Docker app that runs at the edge. You manage the lifecycle of your application and monitor its operation.



# Cisco IOx - Summary

- Cisco IOx
  - is short for “Cisco IOS + Linux”
  - allows you to host custom applications
  - grants your application a share of the device-resources
  - provides access to subsystems and subtended devices
  - is being supported on many devices from the Cisco portfolio
- Applications
  - can be created in VM-style or Docker-style
  - can be managed via CLI, IoT OD or Local-Manager

See: <https://www.cisco.com/c/en/us/products/cloud-systems-management/iox/index.html>

# What is a DevNet Sandbox?

# Cisco DevNet

- DevNet supports Developers with various resources



- DevNet covers all areas of Cisco Business



# Cisco DevNet - Sandbox

The screenshot displays the Cisco DevNet Sandbox Labs interface. The top navigation bar includes the Cisco DevNet logo, "SANDBOX LABS", "RESERVATIONS", and user information "DAECKSTE" and "DEVNET". A search bar is located on the left. The main content area is titled "IoT (14)" and shows a grid of 10 sandbox labs, each with a green card, a version number, a title, a description, and a "RESERVE" button. The labs are arranged in two rows of five. The right sidebar shows a folder icon for "IoT" and a list of "ALL CATEGORIES" including Networking, Collaboration, IoT, Data Center, Cloud, Security, and Open Source. A status indicator at the bottom right shows "1 Currently reserved by me".

**Left Sidebar:**

- Search Sandbox Labs
- Sandbox Labs
- Reservations: 0 New, 1 Total
- FILTER BY:
  - My Sandbox Labs
    - Active (1)
  - Sandbox Lab Status
    - Available
    - Unavailable
    - View only

**Main Content Area: IoT (14)**

Version	Lab Name	Description	Action
Version 1.0	Cisco Partner Solution: Aleantia	Plug&Play gateway for codeless IoT integration with Cisco IOT and GMM	RESERVE
	Cisco Control Center	Cisco Control Center - Multi-Operator SaaS Framework	RESERVE
Version 3.0	Cyber Vision	Get insights from the Industrial IoT	RESERVE
Version 1.0	Edge Intelligence	IoT Operations Dashboard	RESERVE
Version 1.0	Cisco Partner Solution: Eximprod	IoT Energy Utility Solution with Eximprod	RESERVE
Version 1.0	Field Network Director	Manage a multi-service network and security infrastructure for IoT applications	RESERVE
	IE3400 - Industrial Networking & Edge Compute	IE3400 - Industrial Networking and Edge Compute	RESERVE
Version 1.11	IOx CICD Pipeline	Continuous Integration and Delivery Pipeline for Cisco IOx	RESERVE
Version 1.7	IOx CI/CD Pipeline	Continuous Integration and Delivery Pipeline for Cisco IOx	RESERVE
Version 1.11	IOx Latest	Cisco's IoT Edge Compute Platform	RESERVE

**Right Sidebar:**

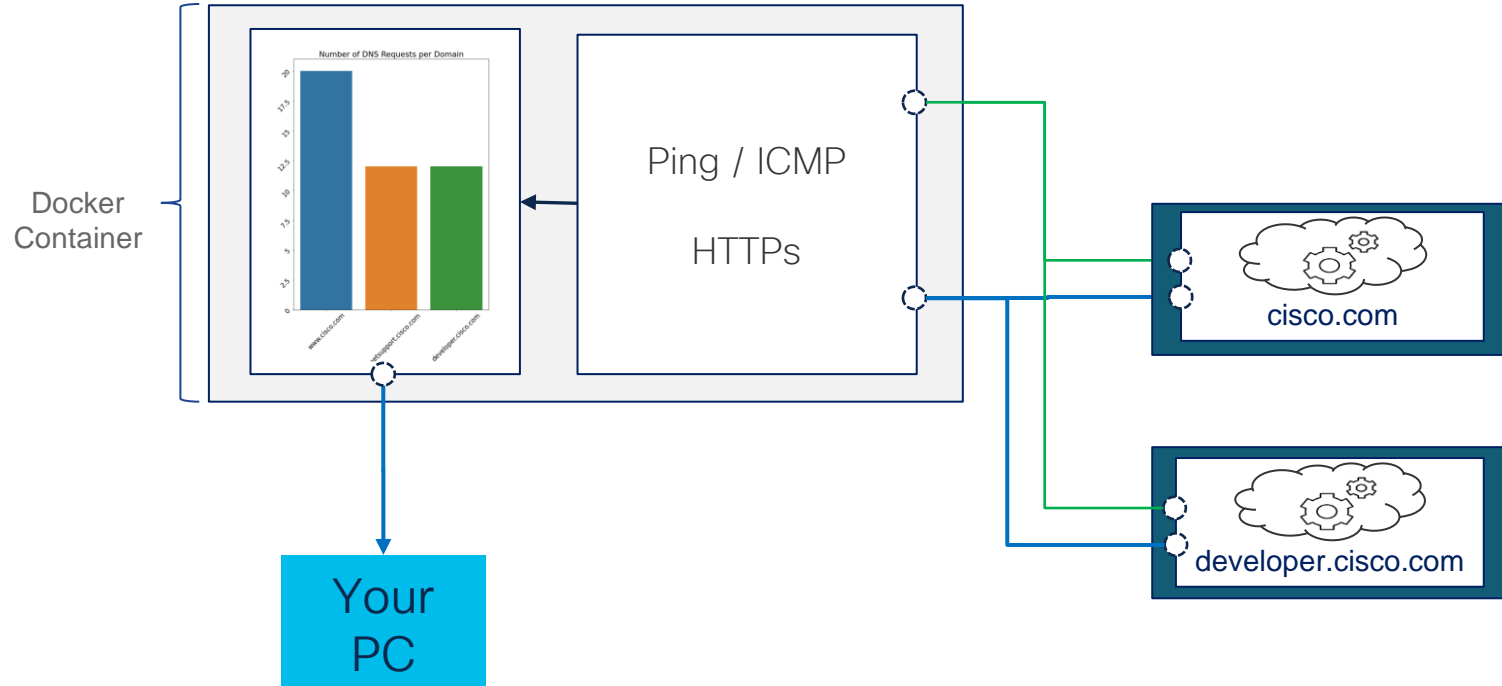
- IoT
- ALL CATEGORIES
  - Networking
  - Collaboration
  - IoT
  - Data Center
  - Cloud
  - Security
  - Open Source

**Status:** 1 Currently reserved by me

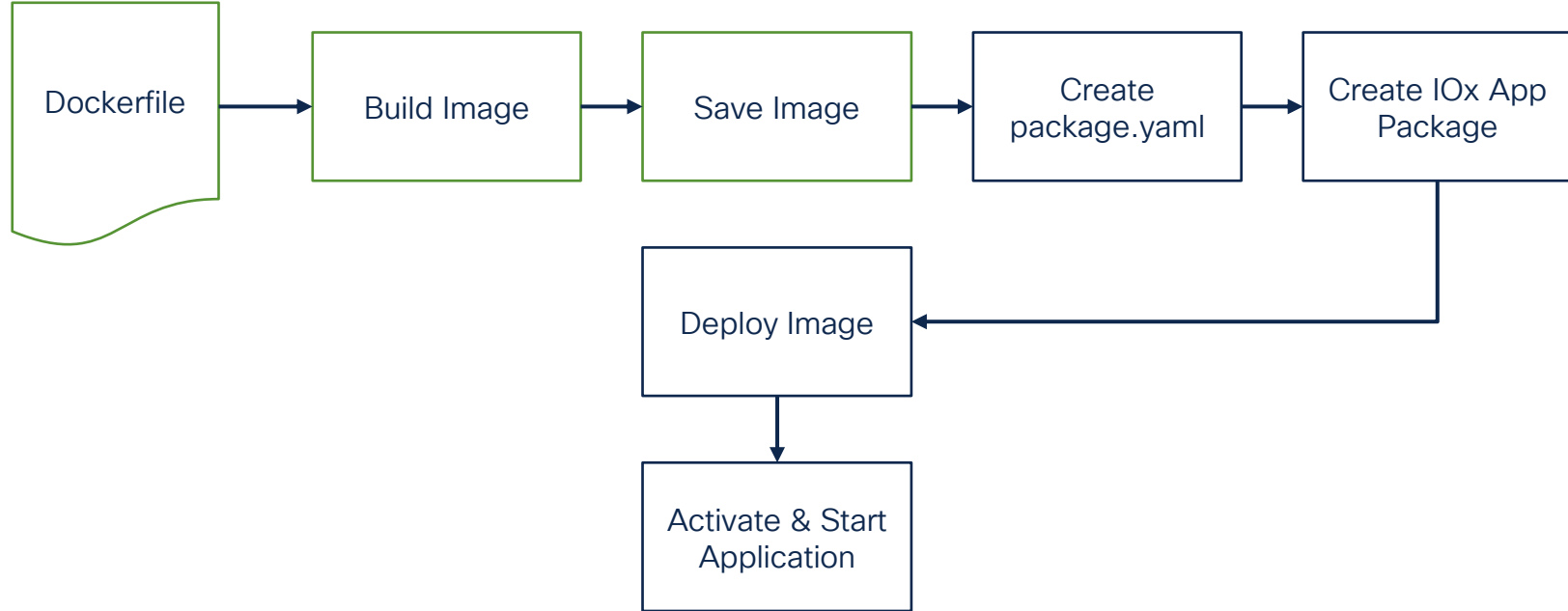
See: <https://devnetsandbox.cisco.com>

Let's prepare  
and install your  
application!

# About your application for today



# Workflow to create your Docker application



package.yaml: <https://developer.cisco.com/docs/iox/#!/package-descriptor>

# Your application internals

```
1 FROM alpine:latest AS build
2
3 RUN apk update && \
4     apk add make g++ jpeg-dev blas-dev blas openblas openblas-dev python3 py3-pip libxml2-dev libxslt-dev gcc libxml2 python3-dev linux-headers musl-dev && \
5     apk add py3-matplotlib py3-wheel py3-numpy py3-scipy py3-pandas && \
6     pip3 install pyshark seaborn && \
7     mkdir -p /data/appdata
8
9 FROM alpine:latest
10
11 RUN apk update && \
12     apk add python3 wireshark-common tshark
13
14 COPY --from=build /usr/lib/python3.8/site-packages/ /usr/lib/python3.8/site-packages/
15 COPY --from=build /usr/lib/libxml2.so.2 /usr/lib/
16 COPY --from=build /usr/lib/libxslt.so.1 /usr/lib/
17 COPY --from=build /usr/lib/libxslt.so.0 /usr/lib/
18 COPY --from=build /usr/lib/libcrypt.so.20 /usr/lib/
19 COPY --from=build /usr/lib/libgpg-error.so.0 /usr/lib/
20 COPY --from=build /usr/lib/libopenblas.so.3 /usr/lib/
21 COPY --from=build /usr/lib/libgfortran.so.5 /usr/lib/
22 COPY --from=build /usr/lib/libgcc_s.so.1 /usr/lib/
23 COPY --from=build /usr/lib/libfreetype.so.6 /usr/lib/
24 COPY --from=build /usr/lib/libstdc++.so.6 /usr/lib/
25 COPY --from=build /usr/lib/libpng16.so.16 /usr/lib/
26 COPY --from=build /usr/lib/libbrotlidec.so.1 /usr/lib/
27 COPY --from=build /usr/lib/libbrotlicommon.so.1 /usr/lib/
28 COPY --from=build /usr/lib/libjpeg.so.8 /usr/lib/
29 COPY --from=build /usr/lib/libopenjp2.so.7 /usr/lib/
30 COPY --from=build /usr/lib/libimagequant.so.0 /usr/lib/
31 COPY --from=build /usr/lib/libtiff.so.5 /usr/lib/
32 COPY --from=build /usr/lib/libxcb.so.1 /usr/lib/
33 COPY --from=build /usr/lib/libXau.so.6 /usr/lib/
34 COPY --from=build /usr/lib/libXdmcp.so.6 /usr/lib/
35 COPY --from=build /usr/lib/libbsd.so.0 /usr/lib/
36 COPY *.py *.sh *.html /data/appdata/
37 RUN addgroup root wireshark
38
39 EXPOSE 8080
40
41 CMD ["/bin/sh", "/data/appdata/start.sh"]
```

- It is a regular Dockerfile
- Example available via github



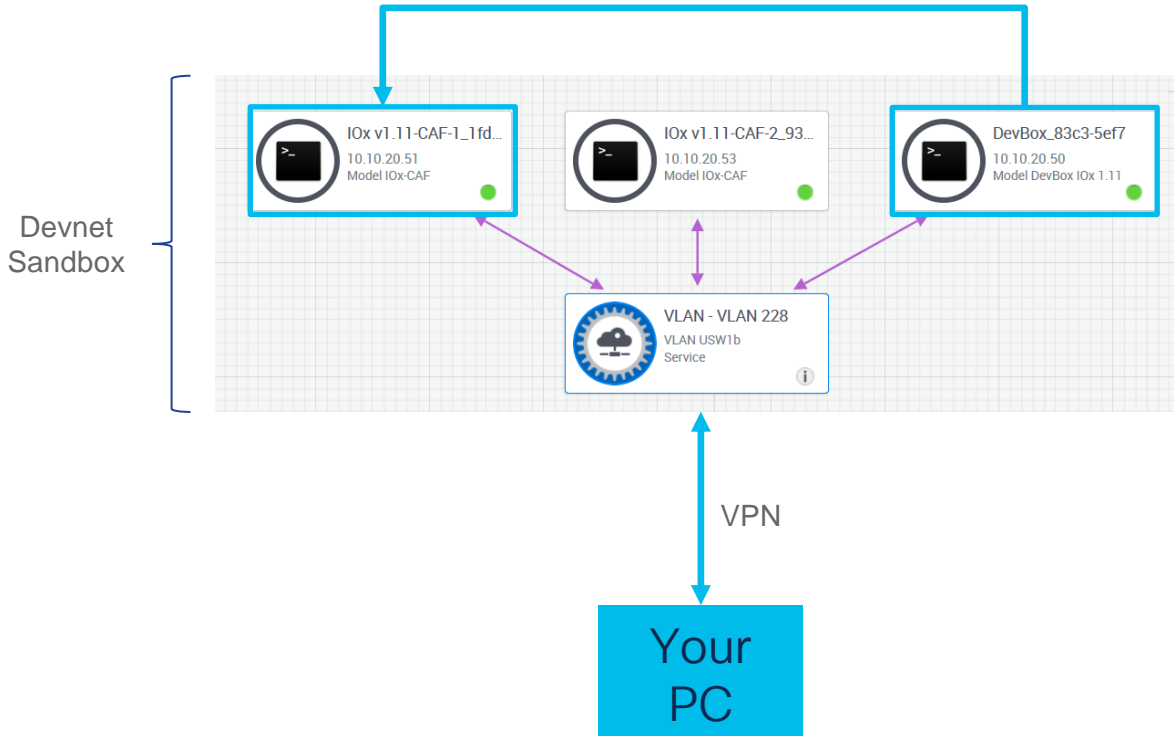
# What we heard so far ...

- **Cisco DevNet** provides you resources for education, exploration and testing
- **Cisco IOx** provides you the capability to host your application on Cisco devices
- Applications can be provided as Docker images

# Preparing and installing an application!

- The overall Setup
- Access your Sandbox
- Create your docker image
- Save your docker image
- Install your docker image to your IOx
- Access your running application

# The overall Setup



1. Get Access
2. Create Docker image
3. Create DevBox
4. Create IOx application
5. Deploy your image
6. Start your application

# But before we start!

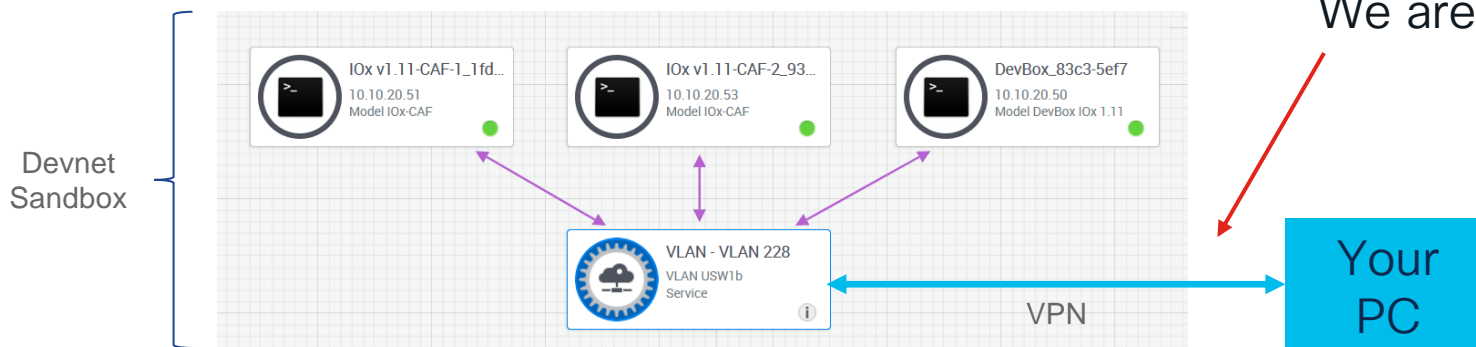


<https://bit.ly/cl2022-iox>



# Access your Sandbox

We are here.



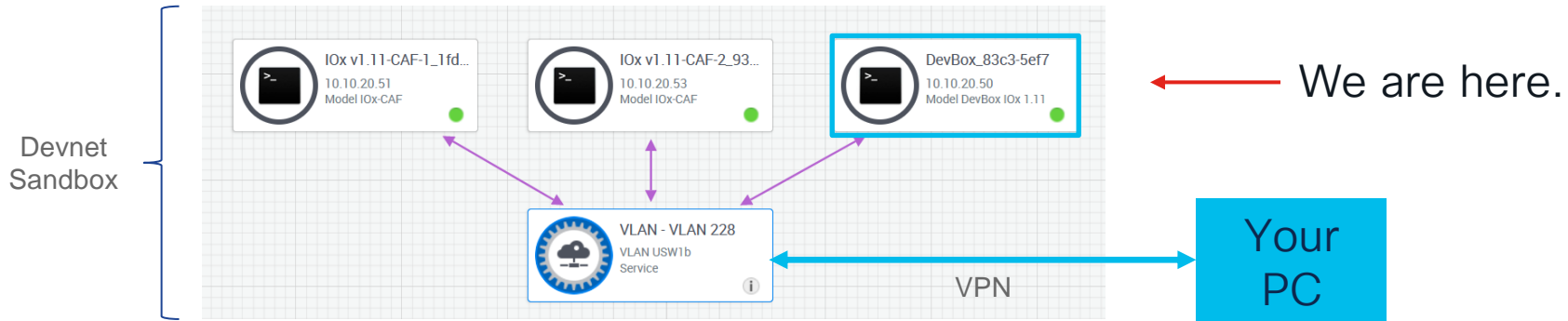
## Current Task:

Use Anyconnect to open a VPN connection to your sandbox.  
Please use the **VPN credentials** provided [here](#).

Use a terminal to log in: **ssh -l developer 10.10.20.50**

Password: **C1sco12345**

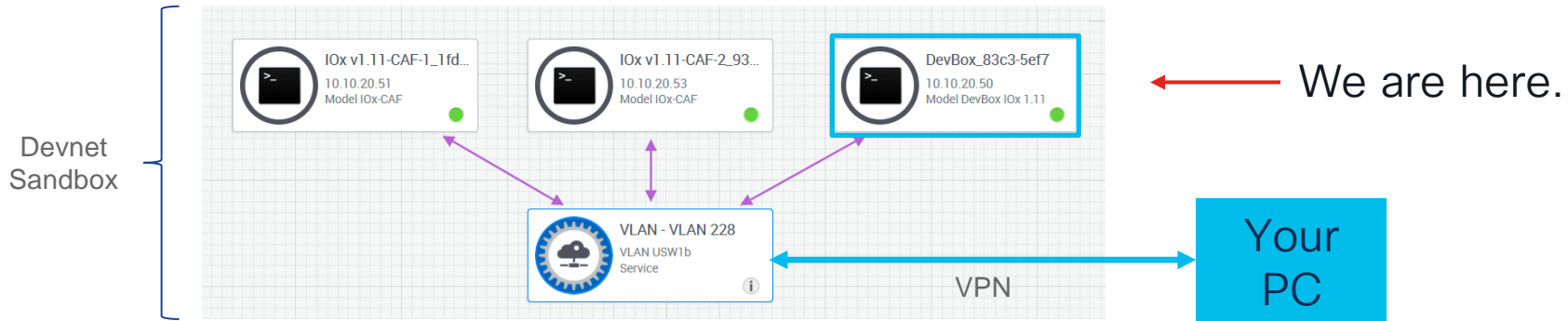
# Create your Docker Image



## Current Task:

```
git clone https://github.com/deckstein/iox-traffic-application
cd iox-traffic-application
docker build . --tag ioxapp
docker image ls
```

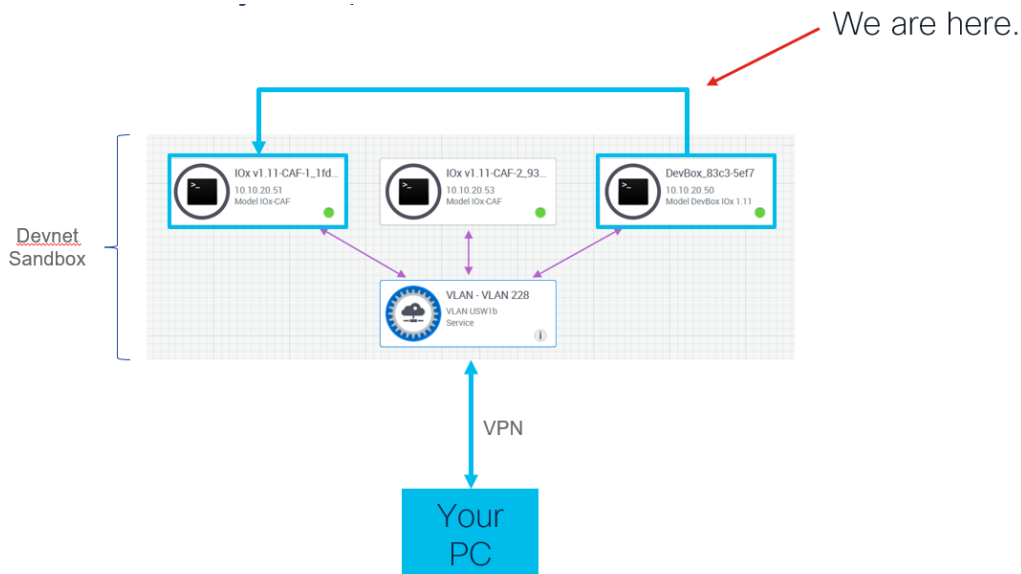
# Save your Docker Image



## Current Task:

```
docker image save ioxapp -o ioxapp.tar
```

# Create your IOx profile



## Current Task:

### ioxclient

Creating one time configuration.

Your / your organization's name : **CLUS22**

Your / your organization's URL :

Your IOx platform's IP address[127.0.0.1] : **10.10.20.51**

Your IOx platform's port number[8443] :

Authorized user name[root] :

Password for root : **cisco123**

Local repository path on IOx  
platform[/software/downloads]:

URL Scheme (http/https) [https]:

API Prefix[/iox/api/v2/hosting/]:

Your IOx platform's SSH Port[2222]:

Your RSA key, for signing packages, in PEM format[]:

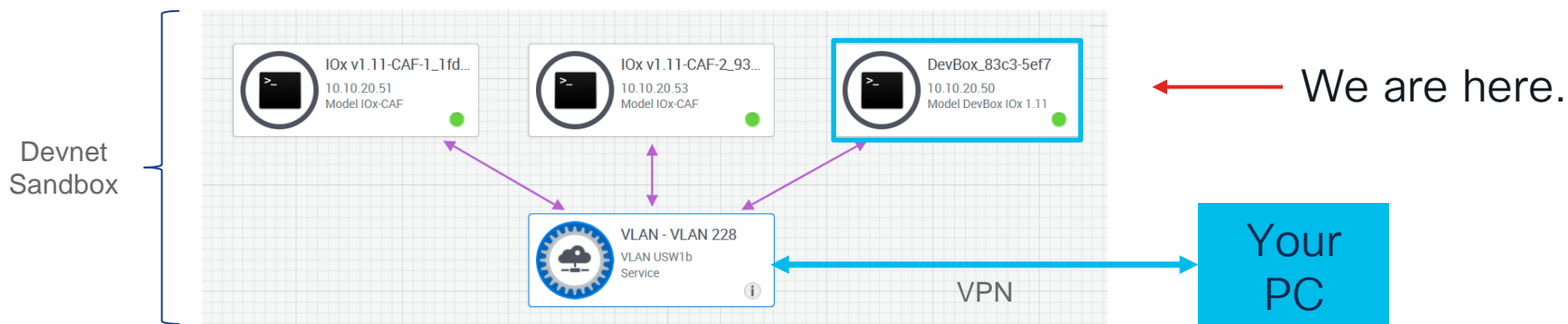
Your x.509 certificate in PEM format[]:

Activating Profile default

Saving current configuration



# Create your IOx application package

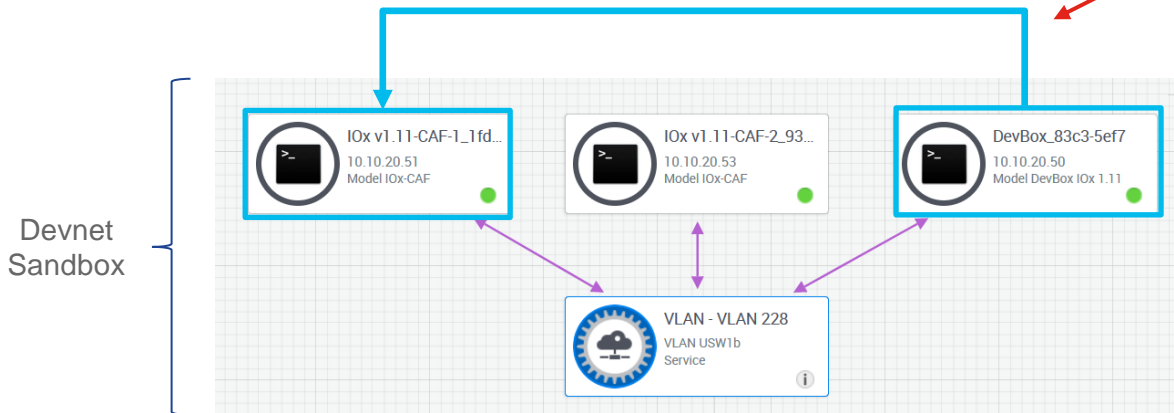


Current Task:

ioxclient docker package ioxapp.tar package/

# Deploy your IOx application package

We are here.

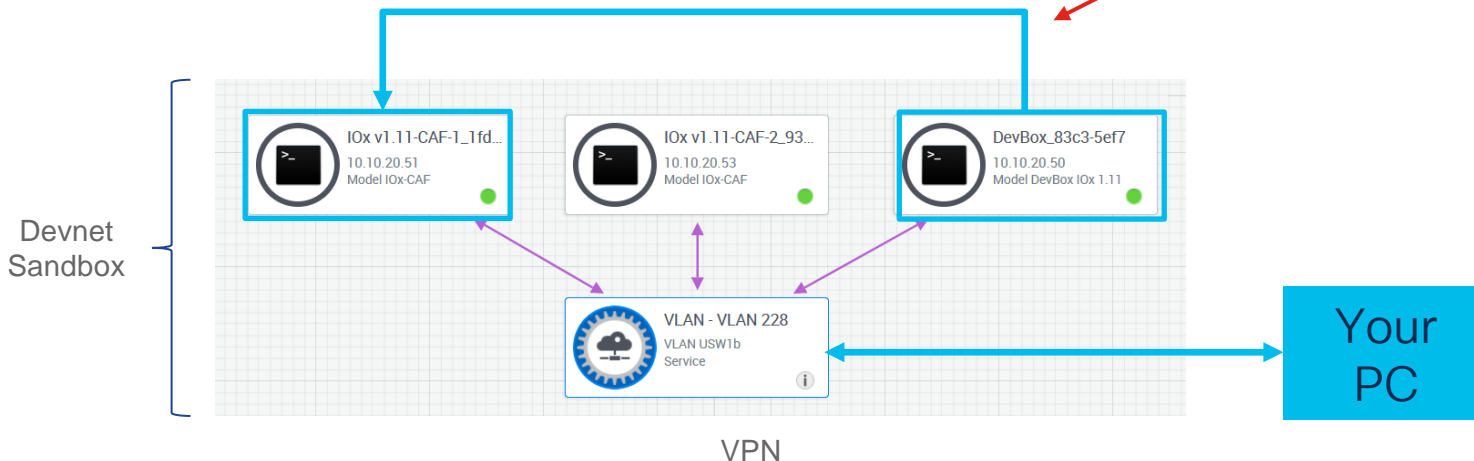


## Current Task:

```
ioxclient --profile CLUS22 application install ioxapp package/package.tar
```

# Activate your IOx application

We are here.

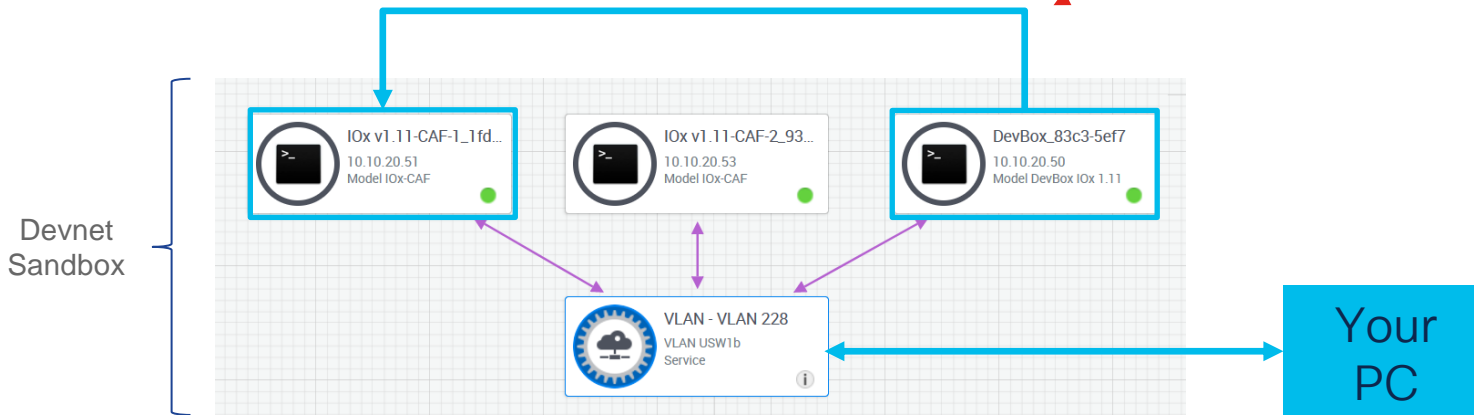


## Current Task:

```
ioxclient --profile CLUS22 application activate ioxapp --docker-opts "-p 8080:8080 --dns 10.17.248.11" --payload activation.json
```

# Start your application

We are here.

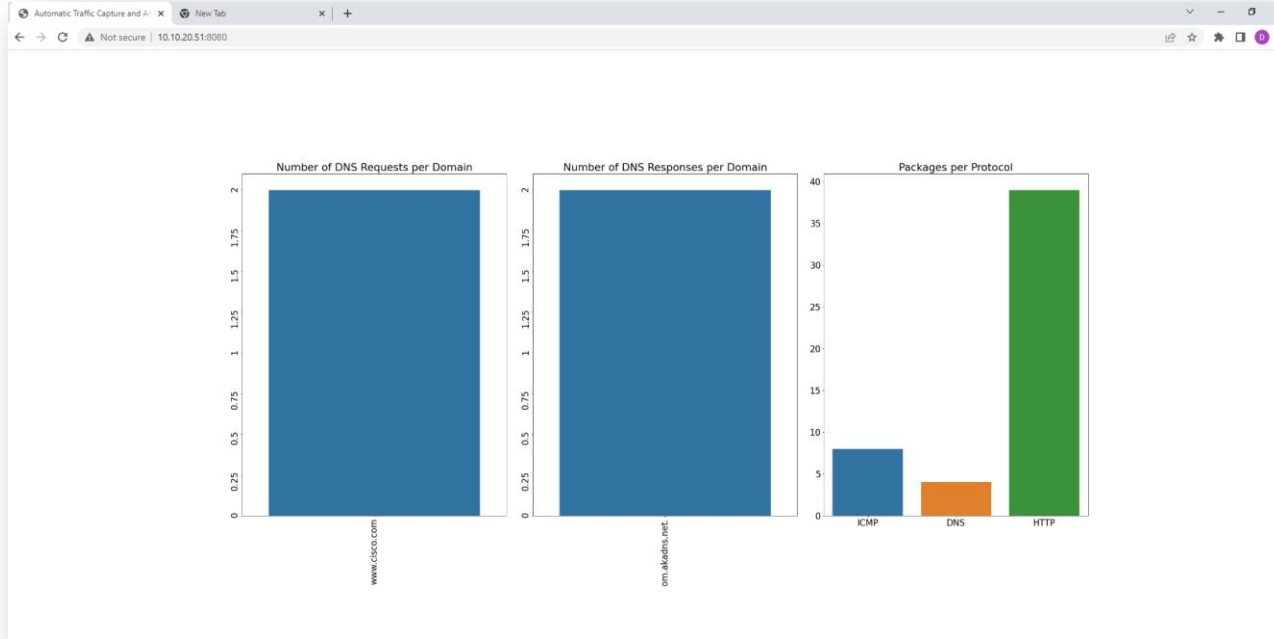


## Current Task:

```
ioxclient --profile CLUS22 application start ioxapp
```

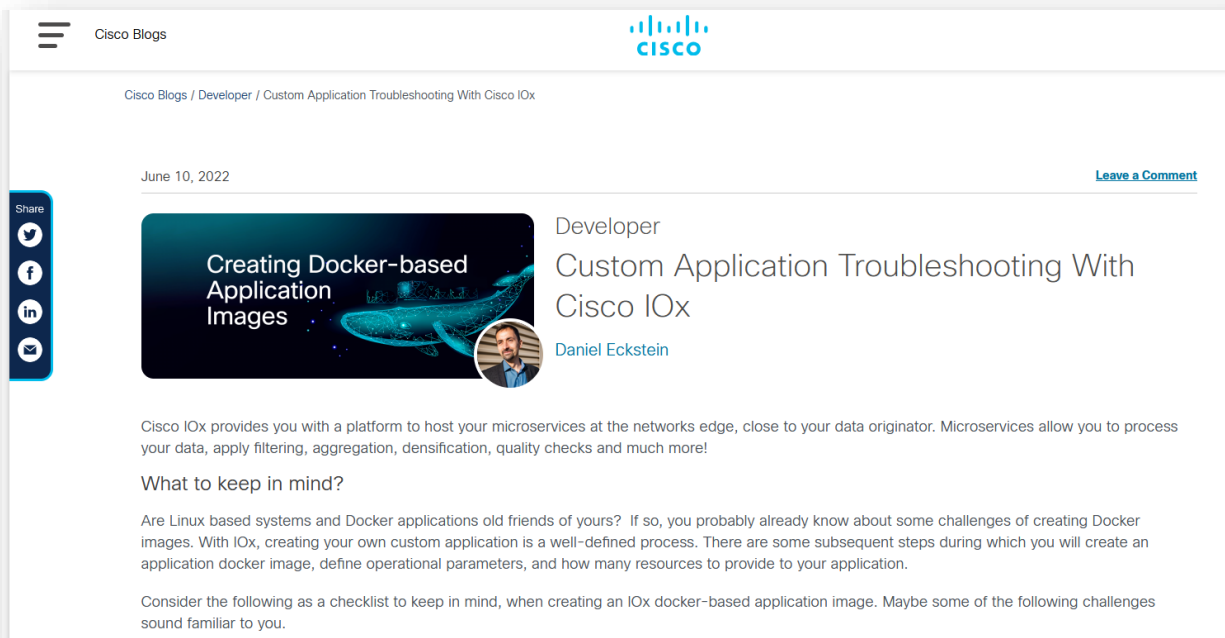
# Access your application

Point your browser to: <http://10.10.20.51:8080/>



# Troubleshooting

Visit: <https://blogs.cisco.com/developer/ioxapplicationtroubleshooting01>



The screenshot shows a Cisco Blogs article page. At the top, there's a navigation bar with the Cisco logo and 'Cisco Blogs' text. Below the navigation bar, the breadcrumb trail reads 'Cisco Blogs / Developer / Custom Application Troubleshooting With Cisco IOx'. The article is dated 'June 10, 2022' and has a 'Leave a Comment' link. The article title is 'Custom Application Troubleshooting With Cisco IOx' by 'Developer Daniel Eckstein'. The featured image shows a blue background with the text 'Creating Docker-based Application Images' and a glowing blue whale. The article text begins with 'Cisco IOx provides you with a platform to host your microservices at the networks edge, close to your data originator. Microservices allow you to process your data, apply filtering, aggregation, densification, quality checks and much more!' followed by the section 'What to keep in mind?' and a paragraph about Linux based systems and Docker applications.

Cisco Blogs / Developer / Custom Application Troubleshooting With Cisco IOx

June 10, 2022 [Leave a Comment](#)

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Creating Docker-based Application Images

Developer  
Custom Application Troubleshooting With  
Cisco IOx  
Daniel Eckstein

Cisco IOx provides you with a platform to host your microservices at the networks edge, close to your data originator. Microservices allow you to process your data, apply filtering, aggregation, densification, quality checks and much more!

What to keep in mind?

Are Linux based systems and Docker applications old friends of yours? If so, you probably already know about some challenges of creating Docker images. With IOx, creating your own custom application is a well-defined process. There are some subsequent steps during which you will create an application docker image, define operational parameters, and how many resources to provide to your application.

Consider the following as a checklist to keep in mind, when creating an IOx docker-based application image. Maybe some of the following challenges sound familiar to you.

# Technical Session Surveys

- Attendees who fill out a minimum of four session surveys and the overall event survey will get Cisco Live branded socks!
- Attendees will also earn 100 points in the Cisco Live Game for every survey completed.
- These points help you get on the leaderboard and increase your chances of winning daily and grand prizes.



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From technology training and team development to Cisco certifications and learning plans, let us help you empower your business and career. [www.cisco.com/go/certs](https://www.cisco.com/go/certs)

## Pay for Learning with Cisco Learning Credits

(CLCs) are prepaid training vouchers redeemed directly with Cisco.



## Learn

### Cisco U.

IT learning hub that guides teams and learners toward their goals

### Cisco Digital Learning

Subscription-based product, technology, and certification training

### Cisco Modeling Labs

Network simulation platform for design, testing, and troubleshooting

### Cisco Learning Network

Resource community portal for certifications and learning



## Train

### Cisco Training Bootcamps

Intensive team & individual automation and technology training programs

### Cisco Learning Partner Program

Authorized training partners supporting Cisco technology and career certifications

### Cisco Instructor-led and Virtual Instructor-led training

Accelerated curriculum of product, technology, and certification courses



## Certify

### Cisco Certifications and Specialist Certifications

Award-winning certification program empowers students and IT Professionals to advance their technical careers

### Cisco Guided Study Groups

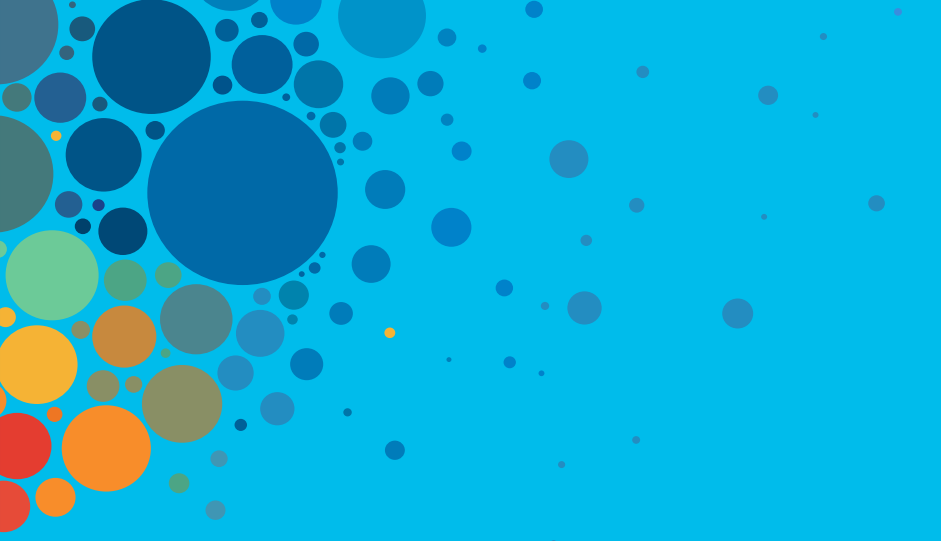
180-day certification prep program with learning and support

### Cisco Continuing Education Program

Recertification training options for Cisco certified individuals

Here at the event? Visit us at **The Learning and Certifications lounge at the World of Solutions**





# Continue your education

- Visit the Cisco Showcase for related demos
- Book your one-on-one Meet the Engineer meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the On-Demand Library for more sessions at [www.CiscoLive.com/on-demand](https://www.CiscoLive.com/on-demand)

# Cisco Webex App

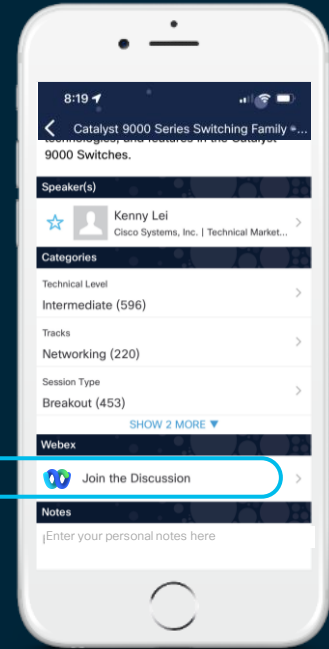
## Questions?

Use Cisco Webex App to chat with the speaker after the session

## How

- 1 Find this session in the Cisco Live Mobile App
- 2 Click “Join the Discussion”
- 3 Install the Webex App or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until June 17, 2022.



<https://ciscolive.ciscoevents.com/ciscolivebot/#DEVWKS-2934>



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# Thank you

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