



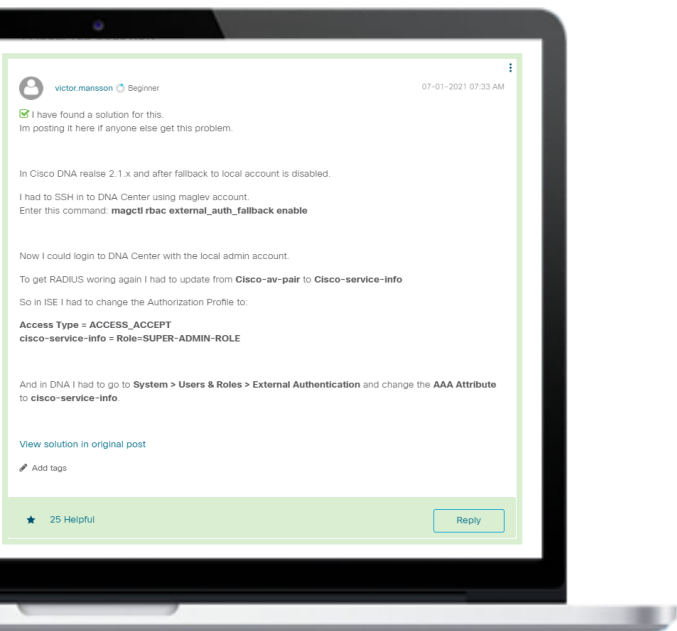
Communauté Cisco Ecrivez une App IoT en Python pour les AP Catalyst 91xx

Jean-François Pujol

TSA, Mobility & Security, Switzerland | Cisco Suisse

26 avril 2022

Connect, Engage, Collaborate!



Lorsque vous recevez une réponse correcte, **acceptez-la comme solution !**

Cela aide les autres utilisateurs à trouver des réponses correctes

Accept as Solution

Mettez en évidence les autres membres

Les votes utiles motivent les membres enthousiastes en leur offrant **un signe de reconnaissance !**



25 Helpful

Spotlight Awards

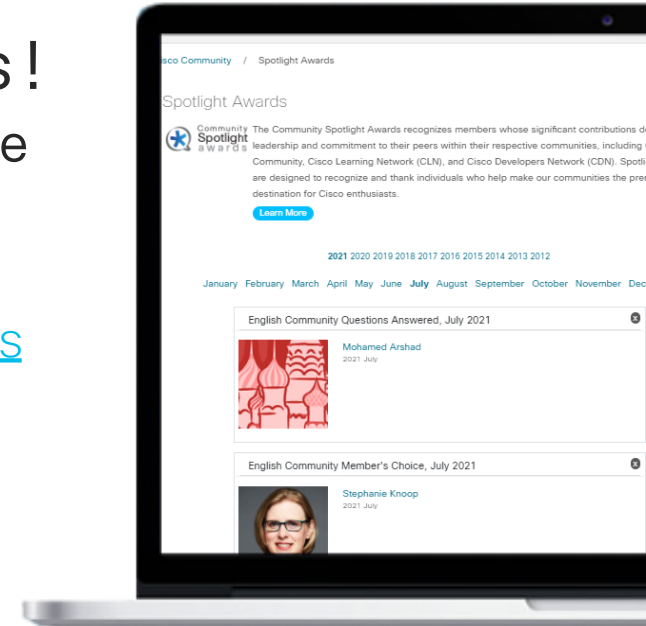


De nouveaux lauréats tous les mois !

Gagnant du mois de Mars : Redouane Meddane

Démarquez-vous par vos efforts et votre engagement à améliorer la communauté et à aider les autres membres. Les [Spotlight Awards](#) sont distribués chaque mois pour mettre en valeur les membres les plus remarquables.

Maintenant vous pouvez aussi désigner un candidat ! [Cliquez ici](#)



Notre Expert



Jean François
Pujol
Présentateur



Jimena
Saez
Modérateur



[Téléchargez la présentation!](#)

Agenda

- Introduction
- Démonstration

Introduction

Application Hosting on Cisco Catalyst Access Points

Enterprise Wireless Internet-of-Things



AP as an IoT
development
platform

Simplified
application
management



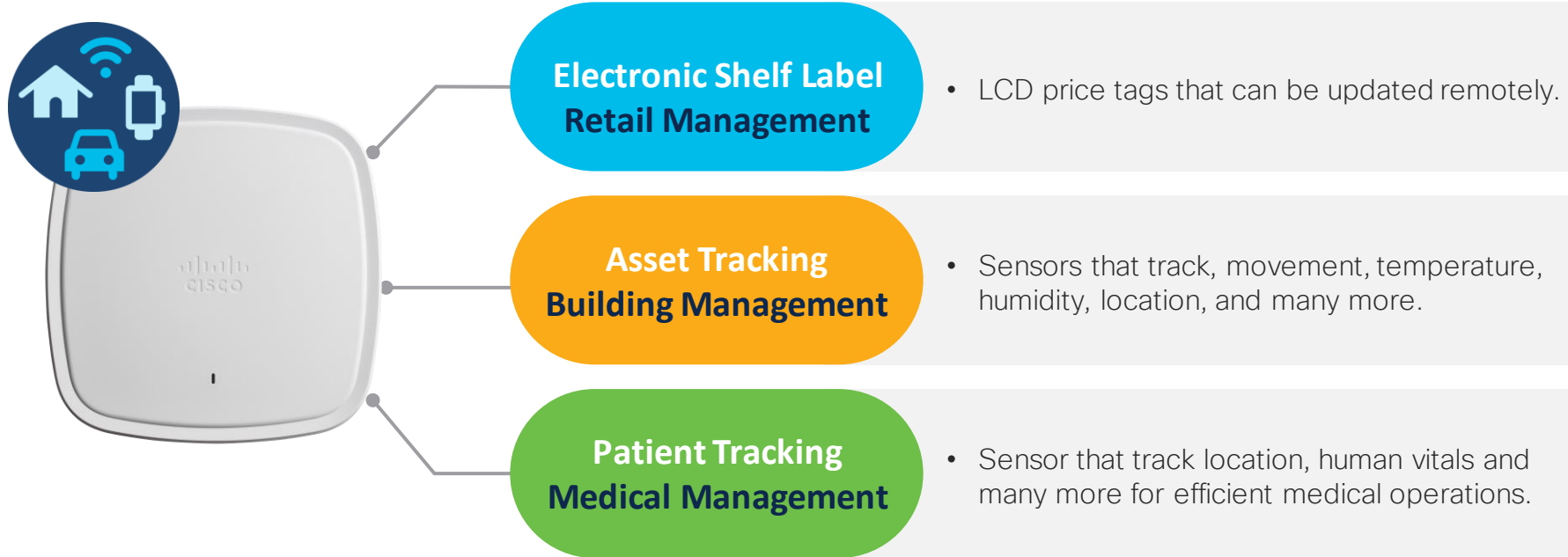
Wi-Fi and IoT
convergence

Ecosystem of IoT
applications

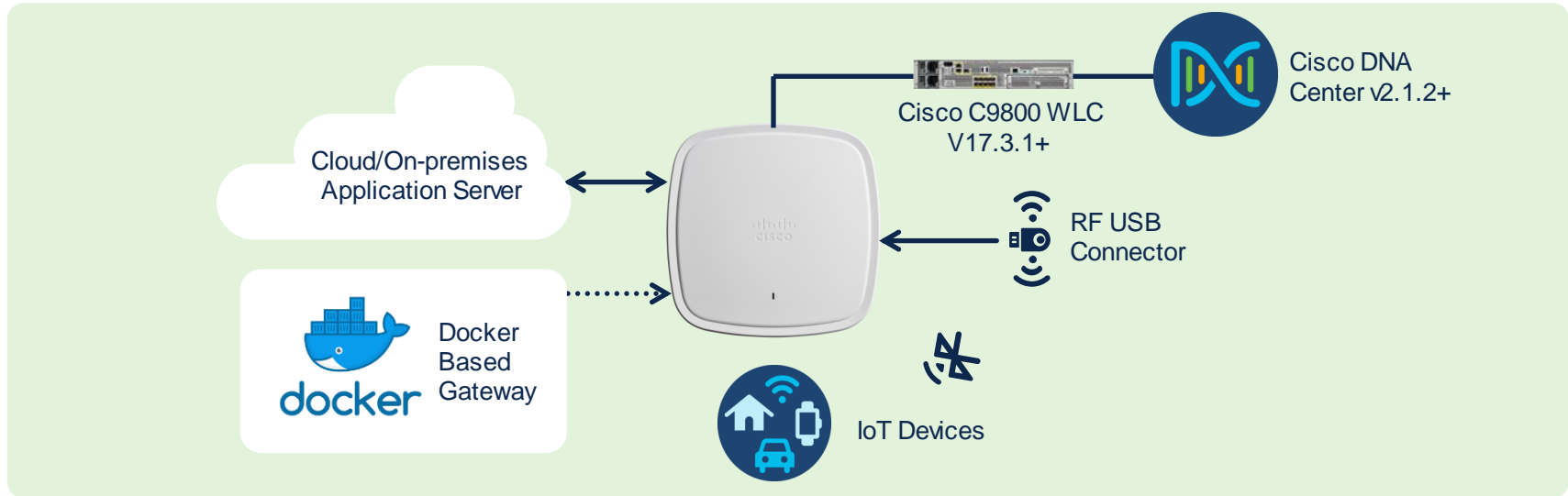


Available in all Cisco® Catalyst® 9100 Access Points

Partner Solution Use Case Segments



IOx Application Hosting Topology



Cisco DNA Center deploys the app

RF USB Connector can be any RF

Catalyst AP acts as an IoT gateway

Cisco solutions to take Wireless beyond Wi-Fi



Cisco DNA Spaces
Indoor IoT Services



Application Hosting
on Cisco DNA Center

Cloud based outcomes to drive Indoor IOT

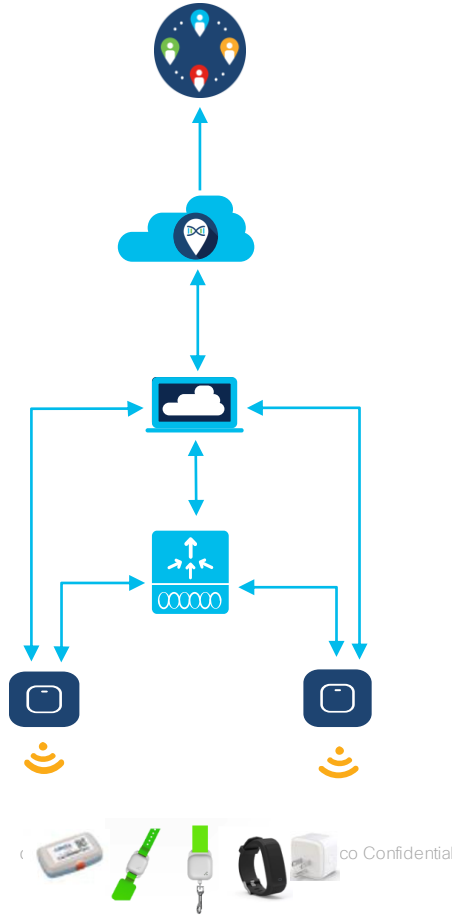
Partners

Cisco DNA Spaces

Cisco DNA Spaces Connector

Infrastructure with C9800

IoT devices / sensors



Unlock IoT Location Based Solutions without overlay networks or on-prem server



Take full advantage of existing Wi-Fi Infrastructure with Base and Advanced Gateway



Reduce TCO and manage multi-vendor, multi-technology IoT landscape with simplicity



Scale out your IoT deployments and management quickly and efficiently



Support for multiple types of wireless IoT technologies with BLE / Zigbee / Thread



IoT Marketplace to help grow your business with comprehensive and validated solutions

BLE Gateways on Cisco APs

Cisco APs with BLE Capability can operate in either Base OR Advanced Gateway functionality:

Base BLE Gateway AP (Native Mode)



Most Wave 2 APs support this



Can support most of the BLE Use Cases



AP BLE radio can either Scan for or Transmit BLE (BLE Rx or Tx)



No Management of 3rd party BLE Beacons or tags. Customer would still require alternative costly methods





BLE Gateways on Cisco APs

Cisco APs with BLE Capability can operate in either Base OR Advanced Gateway functionality:

Base BLE Gateway AP (Native Mode)

- Supports BLE Advertisement (AP as a beacon) OR BLE Scanning
- Can support most of the BLE use cases
- However, no management of 3rd party BLE beacons or tags

Advanced BLE Gateway AP (IOX Mode) – On C9100

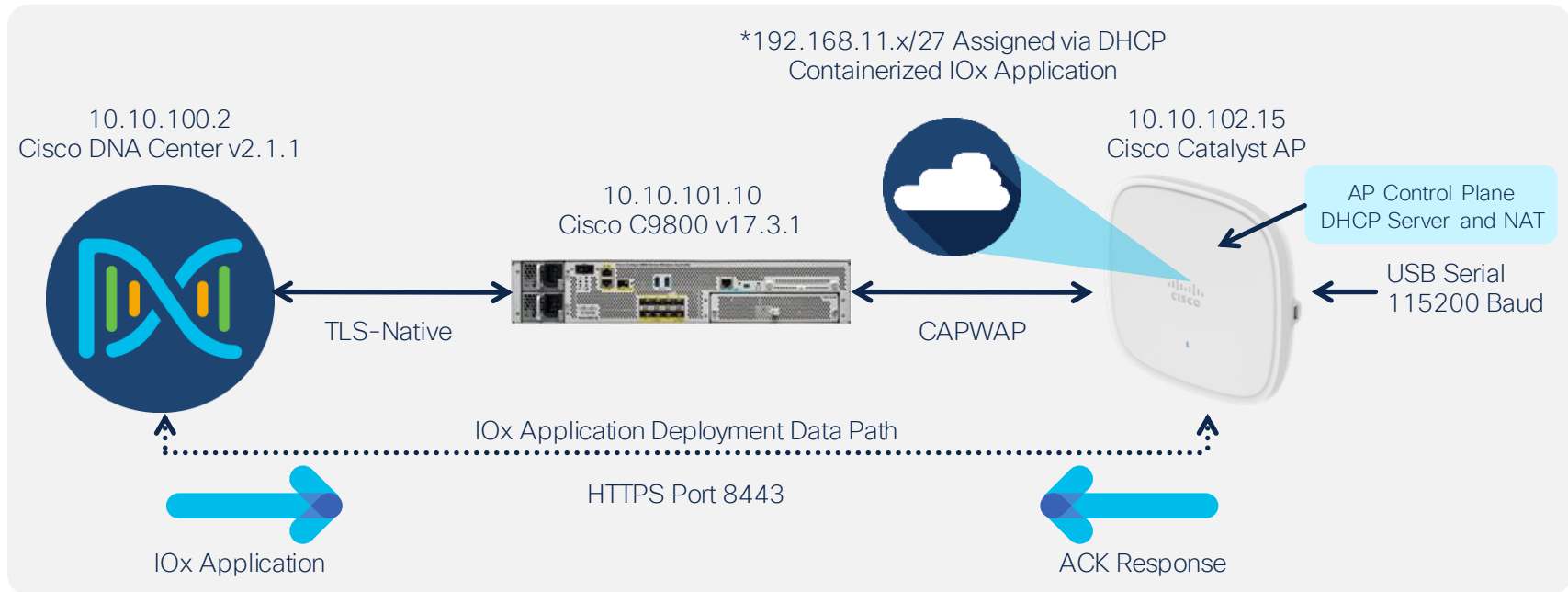
-  *Base Gateway PLUS IOX Application installation (container)*
-  *AP makes 2-way connection to tags for direct management*
-  *Change configuration, Update Firmware, edit packets etc.*
-  *AP functions same as a vendor's proprietary gateway installation*

Application Hosting vs Indoor IoT Service



	Application Hosting	Indoor IOT Service
Docker Package Management	Cisco DNA Center 2.1.2+	Cisco DNA Spaces
IoT Integration	3 rd Party USB Peripheral or use AP Embedded IOT Radio	Use AP Embedded IOT Radio
Service Platform	Solution is provided by the 3 rd Party Partner while Cisco's Application Hosting provides infrastructure	Solution is provided by DNA Spaces API and the Indoor IOT Service platform
Developer Support	DevNet	DNA Spaces EXT
License	DNA Advantage	DNA Spaces ACT

Application Hosting Network topology



*The IOx Application's traffic is locally switched and communicates to external sources through NATting the AP's IP

IOx Application Deployment Details

- Cisco DNA Advantage license required

Licensing



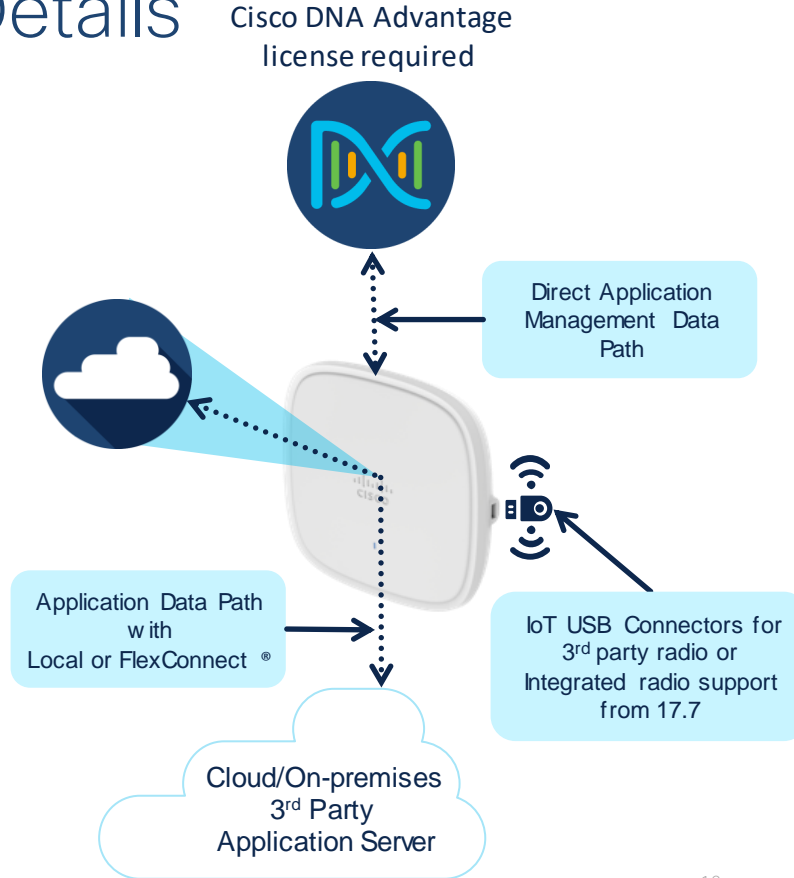
- Supports up to 2 applications.

Compatibility

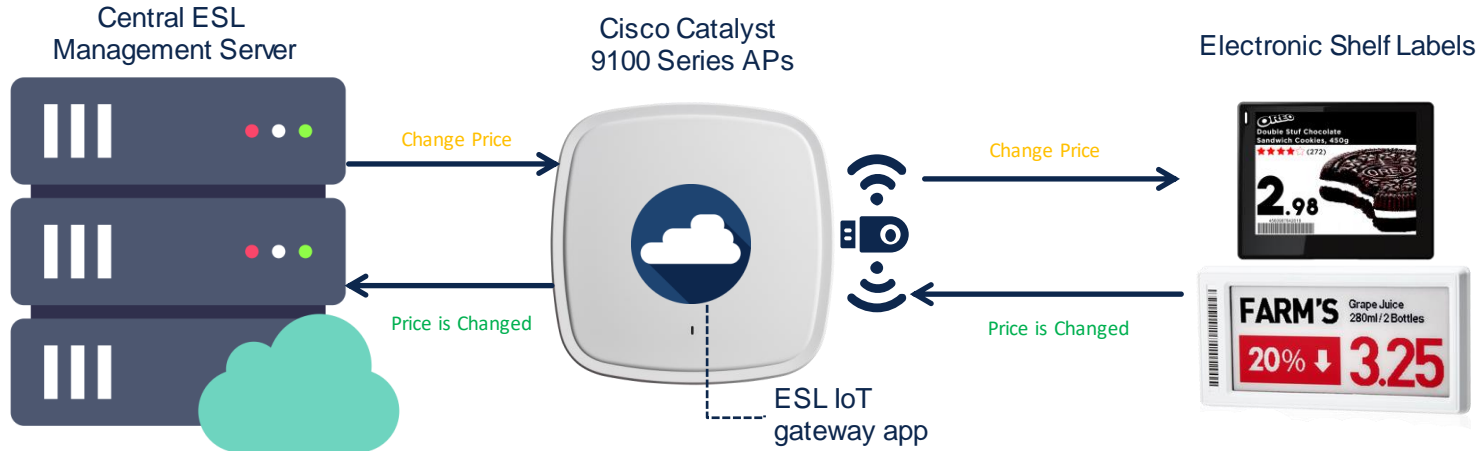


- Dedicated resources given to the application.
- Application security is dependent on the application developer.

Security

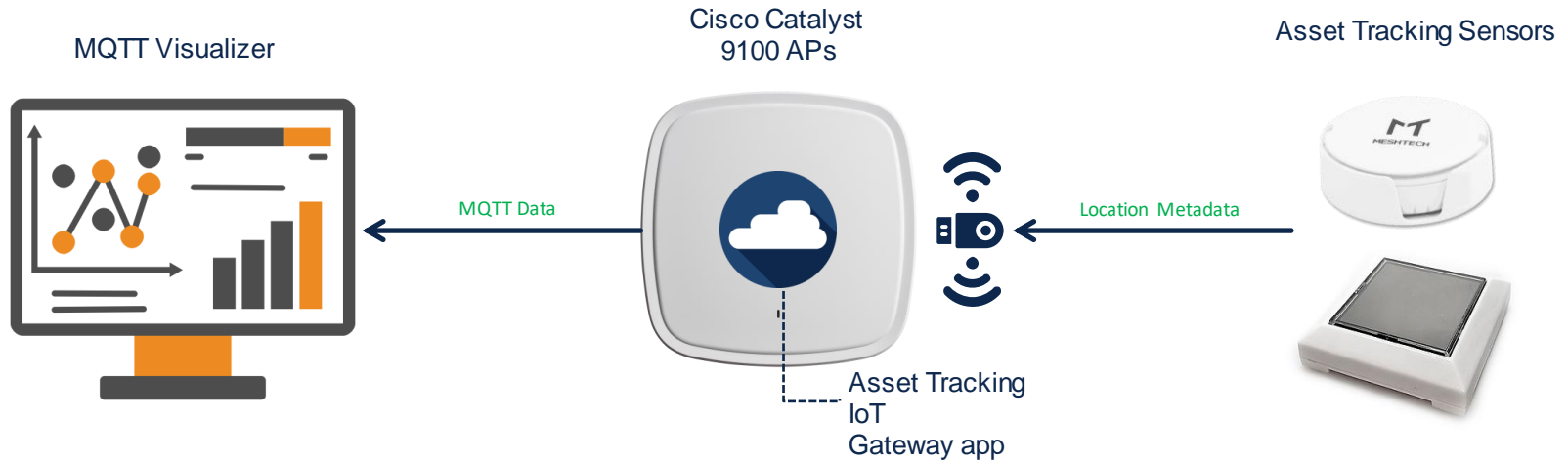


Retail Store IoT ESL Experience



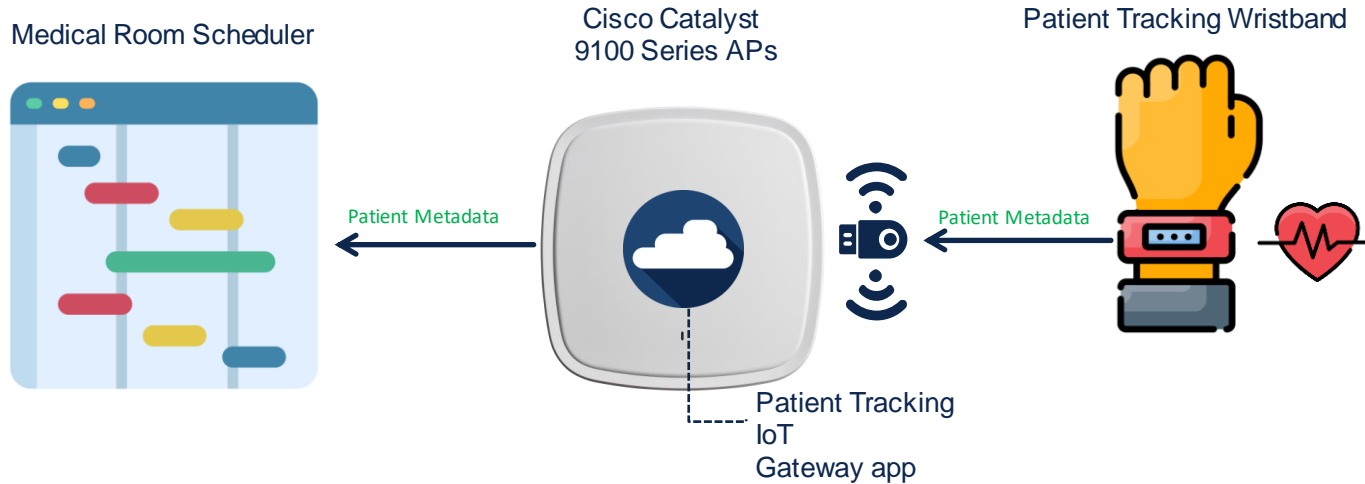
Update all Electronic Shelf labels from a single application server!

Asset Tracking IoT Experience



Sensors provide data such as location, temperature, movement and many more!

Patient Tracking IoT Experience



Simplify medical operations by understanding a patient's vitals and whereabouts!

Application Development – Docker

- An open platform for developing, shipping, and running applications.
- Allow to package an application with all of its dependencies into a standardized unit for software development.

Native Docker
App



Container creation

1 Dockerfile

```
FROM ubuntu:18.04 as base
RUN apt-get update -yq && apt-get install -yq python
COPY poll-temperature.py /usr/bin/poll-temperature.py
RUN chmod 777 /usr/bin/poll-temperature.py
CMD /usr/bin/poll-temperature.py
```



Application File

```
#!/usr/bin/Python
import time
import os
os.makedirs("/var/volatile/log")
f = open("/var/log/poll-temp.log", "w")
while (1):
s = "%s %s polling temperature ...!\n" %
(time.strftime("%d/%m/%Y"), time.strftime("%l:%M:%S"))
f.write(s)
f.flush()
time.sleep(5)
```

2 Build Docker Image

```
docker build -t <app> .
```

3 Docker Image

App / container deployment

Docker Image



1 The IOx package
App descriptor

```
descriptor-schema-version: "2.0"
info:
  name: persona
  description: "NetF500M 4.0"
  version: "1.0.0"
  author-link: "https://www.cisco.com"
  author-name: Cisco
app:
  # Indicate app type (fw, pass, etc...)
  search: ams_54
  type:
    kernel-version: 4.4.51
resources:
  profile: custom
  vcpu: 2
  cpu: 2000
  disk: 10
  memory: 2048
network:
  - interface-name: eth0
# Specify runtime and startup
startup:
  rootfs: rootfs.img
  target: /etc/init.d/iox_start.sh
```



2 ioxclient

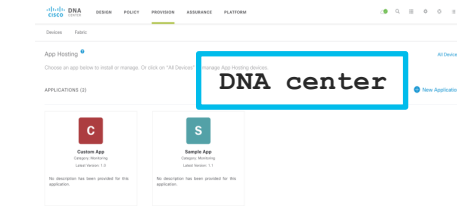
```
ioxclient > package.tar
```



3 Deploy App (package.tar
CLI or DNAC)

CLI

```
ioxclient AP_profile
```



Cisco DNA Center – App Hosting

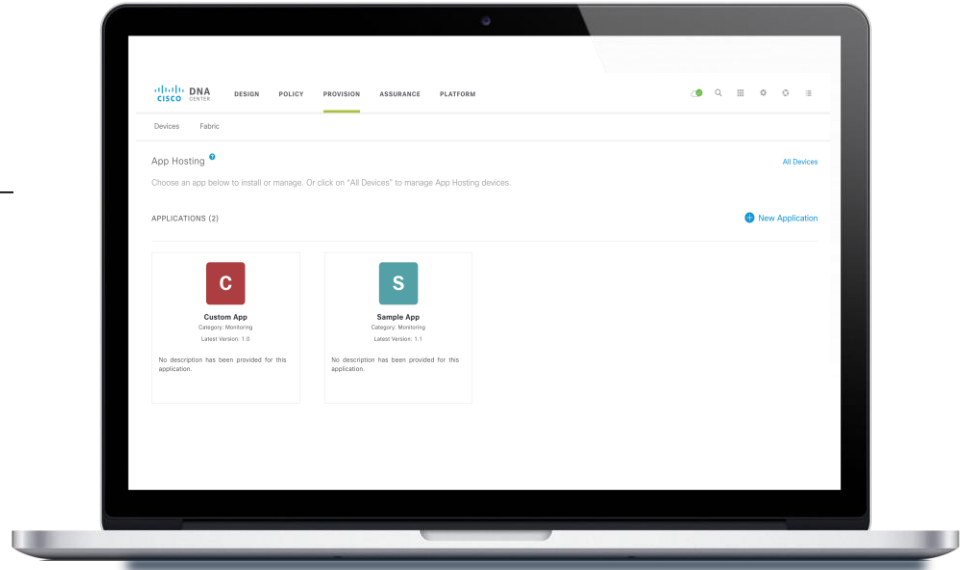
Enterprise Single Pane of Glass

Consistent Cisco DNA Center workflows

App Lifecycle

Provisioning of multiple devices

Change management



App Hosting SW and HW Support Matrix

Now Supporting the C9124AX Outdoor AP from 17.5.1

FOR REFERENCE

IOS-XE WLC Release		Cisco DNA Center Release	
17.3.1 and above		2.1.2.0 and above	
Access point PID	WLC PID		
C9105AXI	C9800-CL		
C9105AXW			
C9115AX	C9800-L		
C9117AX			
C9120AX	C9800-40		
C9130AX			
C9124AX	C9800-80		

Supported Access Points Resources Matrix

FOR REFERENCE

AP	CPU Architecture	Max Memory (RAM allocated for IOx Apps)	Supported App Types	Max IOx apps (that can be installed)	Max App Size	USB Support for IOx
C9105AXI	ARM 32 bit	200 MB	Docker	2	~20MB	No
C9105AXW	ARM 32 bit	200 MB	Docker	2	~20MB	Yes
C9115AX	ARM 64 bit	400 MB	Docker	2	~20MB	Yes
C9117AX	ARM 64 bit	400 MB	Docker	2	~20MB	Yes
C9120AX	ARM 64 bit	400 MB	Docker	2	~20MB	Yes
C9130AX	ARM 64 bit	400 MB	Docker	2	~20MB	Yes

New IoT Partners Coming Soon!

Electronic Shelf Label Retail Management



Asset Tracking Building Management



Patient Tracking Medical Management



Application Hosting Solution Pages

Application Hosting Homepage

Networking > Application Hosting on Access Points

Docs Solutions Support

Application Hosting on Catalyst 9100 Access Points

Transform the access point into a powerful IoT platform and enable IoT deployment at scale. Create your own docker applications to run on the Cisco Catalyst 9100 Access Points.

[View the docs](#)

NEW SOLUTION
SOLIM Electronic Shelf Labels

ALL SOLUTIONS
Partner solutions in Ecosystem Exchange

NEW SOLUTION
SES-Himgotag Electronic Shelf Labels

How can application hosting on access points help?

Eliminate the need to install and manage an overlay network when deploying IoT use cases at the enterprise.

- AP as an IoT gateway**
Catalyst Access Points (AP) can now run dockerized applications. With this innovation, you can create and deploy custom IoT applications, enabling faster and more scalable IoT deployments.
- Support for modularity**
Leverage the AP's USB interface to be used with custom IoT modules to connect your app with sensors, tags, or other IoT devices.

Solution Partner Ecosystem

DEVNET

Cisco Ecosystem Exchange > Solution Partner Program

Solution Showcase Join Solution Partner Program Contact Us

Solution Partner Program

Explore the catalog for Cisco-approved solutions that work seamlessly with your infrastructure. Solution partner offerings can help solve your toughest business challenges, across any industry, and any technology.

What bring are you looking for?

Industry: Networking | APP Hosted

Analytics | Region | Experience

Cisco Compatible

- NetBeez, Inc.**
NetBeez for Cisco Catalyst 9000 Series Switches
NetBeez has developed a real-time, distributed, performance monitoring solution that proactively detects network and application problems. The NetBeez platform actively...

- Telomanager Technologies**
TRIAp for Cisco Catalyst 9000 Series Switches
TRIAp collects flow data from Cisco Netflow and other flow protocols such as netstream and sFlow. It then classifies the traffic based on user configurations such as address and application...

- CyberMDX Technologies Inc.**
CyberMDX app for Cisco Catalyst 9300
This solution embeds CyberMDX deep packet inspection as an app running on the Catalyst 9300 compute module, allowing customers to share CyberMDX hardware-focused insights...

<https://developer.cisco.com/app-hosting-ap/>

<https://developer.cisco.com/ecosystem/spp/?ccid=cc001279&dtid=odiprc001089>

References

Application Hosting on the Catalyst Access Point Deployment Guide

- <https://www.cisco.com/c/en/us/products/collateral/wireless/access-points/guide-c07-744305.html>

IOx application guides

- <https://developer.cisco.com/docs/app-hosting-ap/>
- <https://developer.cisco.com/docs/iox/#!introduction-to-iox/what-is-iox>
- <https://developer.cisco.com/docs/iox/#!what-is-ioxclient>
- <https://developer.cisco.com/docs/iox/#!tutorial-build-sample-docker-type-iox-app-using-docker-toolchain/tutorial-build-sample-docker-type-iox-app-using-docker-toolchain>

Application Hosting Video Guides

- The Internet of Things - Application Hosting Overview & Use Cases
https://www.youtube.com/watch?v=ZDRkKOTLAt8&ab_channel=CiscoWLAN
- The Internet of Things - Application Hosting Deployment & Technical Deep Dive
https://www.youtube.com/watch?v=0u3FGIRrdhU&ab_channel=CiscoWLAN

Cisco and Wipilot – First UWB-Based Location System with App Hosting!

<https://blogs.cisco.com/networking/cisco-and-wipilot-first-uw-based-location-system-with-app-hosting>

Demo 1 : Basic app in python

Basic app on a single 9100 AP deployment

Your reference

- <https://www.cisco.com/c/en/us/products/collateral/wireless/access-points/guide-c07-744305.html>
- <https://developer.cisco.com/docs/app-hosting-ap/#!application-hosting-on-cisco-catalyst-access-points-application-hosting-on-cisco-catalyst-access-points>

You need:

- Docker
- ioxclient

The screenshot shows the Cisco DevNet documentation page for "Application Hosting on Cisco Catalyst Access Points". The page includes a navigation menu on the left with sections like "Overview", "Architecture", "Getting Started", "Resources", and "Support". The main content area features an "Overview" section with a description of application hosting on Cisco Catalyst 9100 series access points, followed by a list of links to "Overview and Use Cases" and "Steps for Application Hosting on APs and Deployment". Below this is an "Architecture" section with a diagram titled "IOx Application Hosting General Topology".

IOx Application Hosting General Topology

The diagram illustrates the architecture of application hosting on access points. It shows a central "IOx Application Server" connected to a "Cisco Catalyst 9100 Series Access Point". The server is also connected to a "Cisco ISE Policy Service Node" and a "Cisco ISE Policy Service Engine". The access point is connected to a "Cisco Catalyst 9100 Series Access Point" and a "Cisco Catalyst 9100 Series Access Point". The diagram also shows a "Cisco Catalyst 9100 Series Access Point" connected to a "Cisco Catalyst 9100 Series Access Point".

What we are going to do (CLI installation)

preparing config files :

- iox_basic_app.py
- dockerfile
- package.yaml (and activation.json)

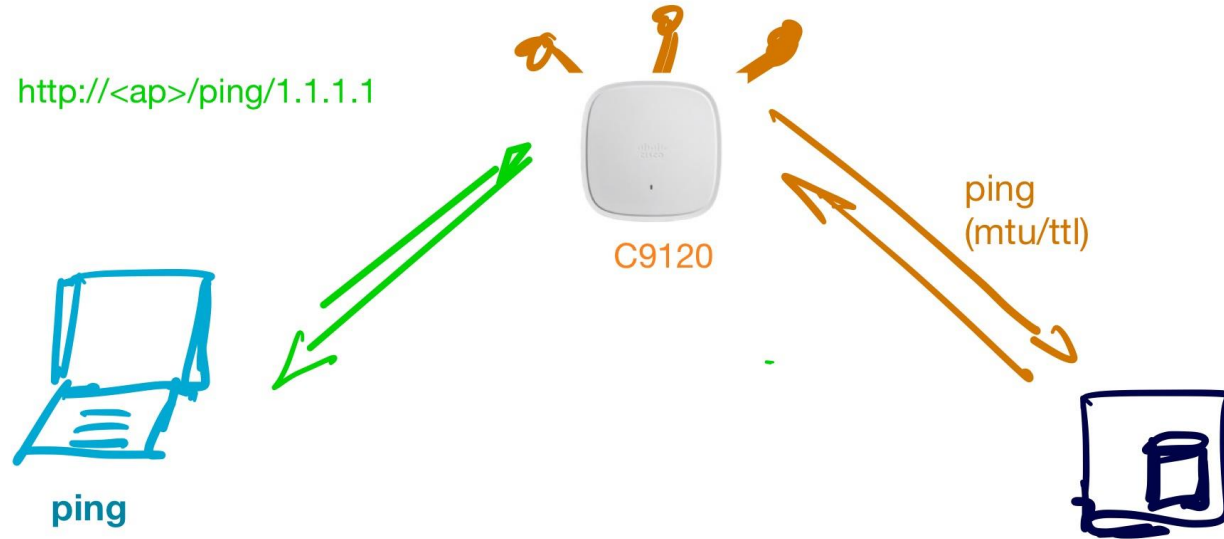
then :

- ioxclient profiles create (for each target access-point)
- docker build -t iox_basic_app .
- sudo ioxclient docker package -p ext2 -r -1 iox_basic_app ./package.dir/
- ioxclient --profile AP9120I.5130 application install iox_basic_app package.dir/package.tar
- ioxclient --profile AP9120I.5130 application activate iox_basic_app --payload activation.json
- ioxclient --profile AP9120I.5130 application start iox_basic_app

Demo 2 : ping app

Proxy ping from a single 9100 AP

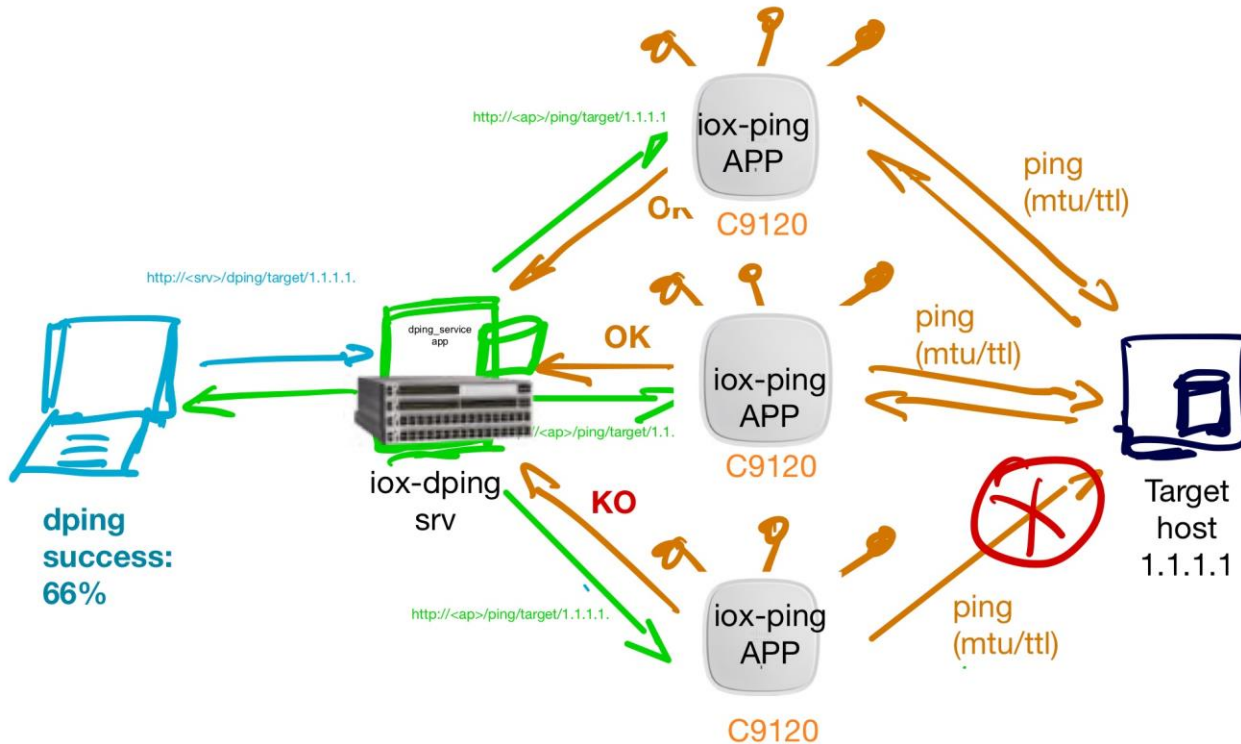
Ping app (ping proxy)



Demo 3 : Distributed ping app

Distributed Ping with multiple c9100 APs orchestrated from a c9300 app

Distributed Ping app (ping botnet)





Avez-vous encore des questions ?
Utilisez le panneau « Q&R »

Prochains événements



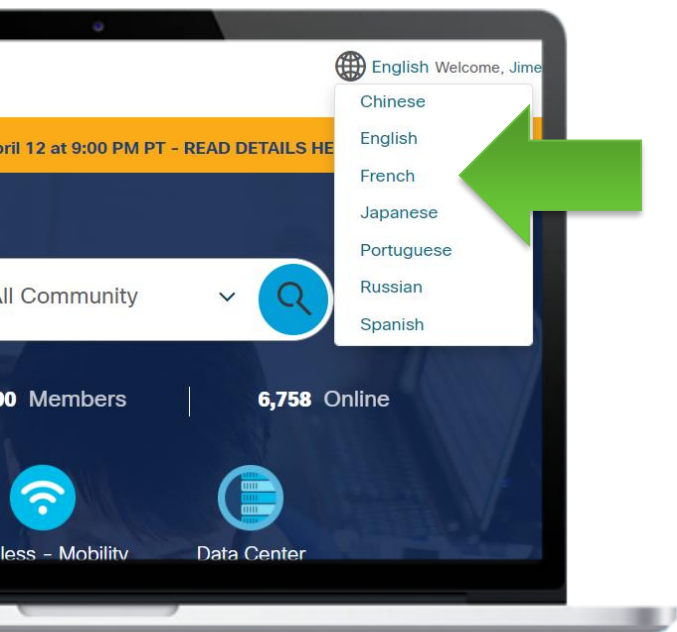
26 AVR Ask Me Anything : Écrivez une application IOT en python pour les AP Catalyst 91xx <https://bit.ly/AMA2-apr22>

05 MAI Community Live : Le projet de déploiement SD-WAN en environnement Cisco (Part 2.b) <https://bit.ly/WEB-FRmay22>

Événements à venir

[Calendrier : Inscrivez-vous ici!](#)

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Avez-vous des commentaires ?
Répondez à notre enquête !



