



Hostování aplikace na síťových prvcích. Proč? Jak? K čemu?

Dominik Soukup
Peter Morvay
26.4.2022

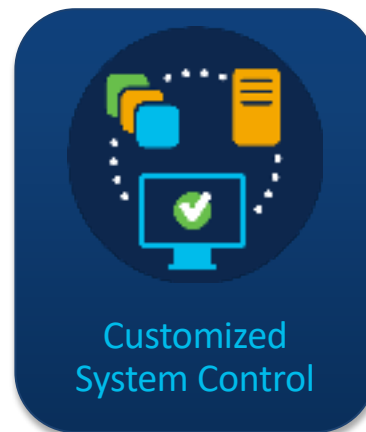
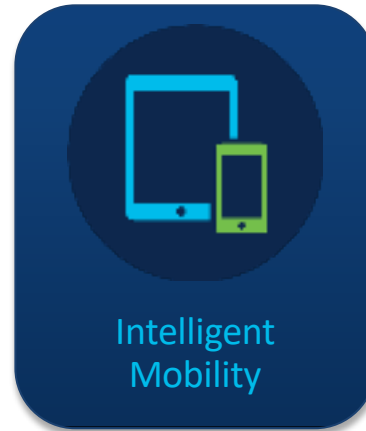
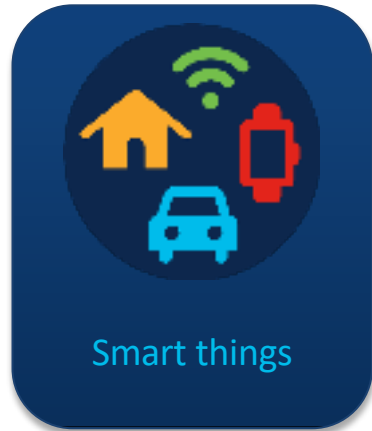
Agenda

- Motivace pro hostování aplikací (Proč?, Kde?)
- Způsob vytvoření aplikace (Jak?)
- Příklady využití aplikací (K čemu?)



Edge Compute Evolution

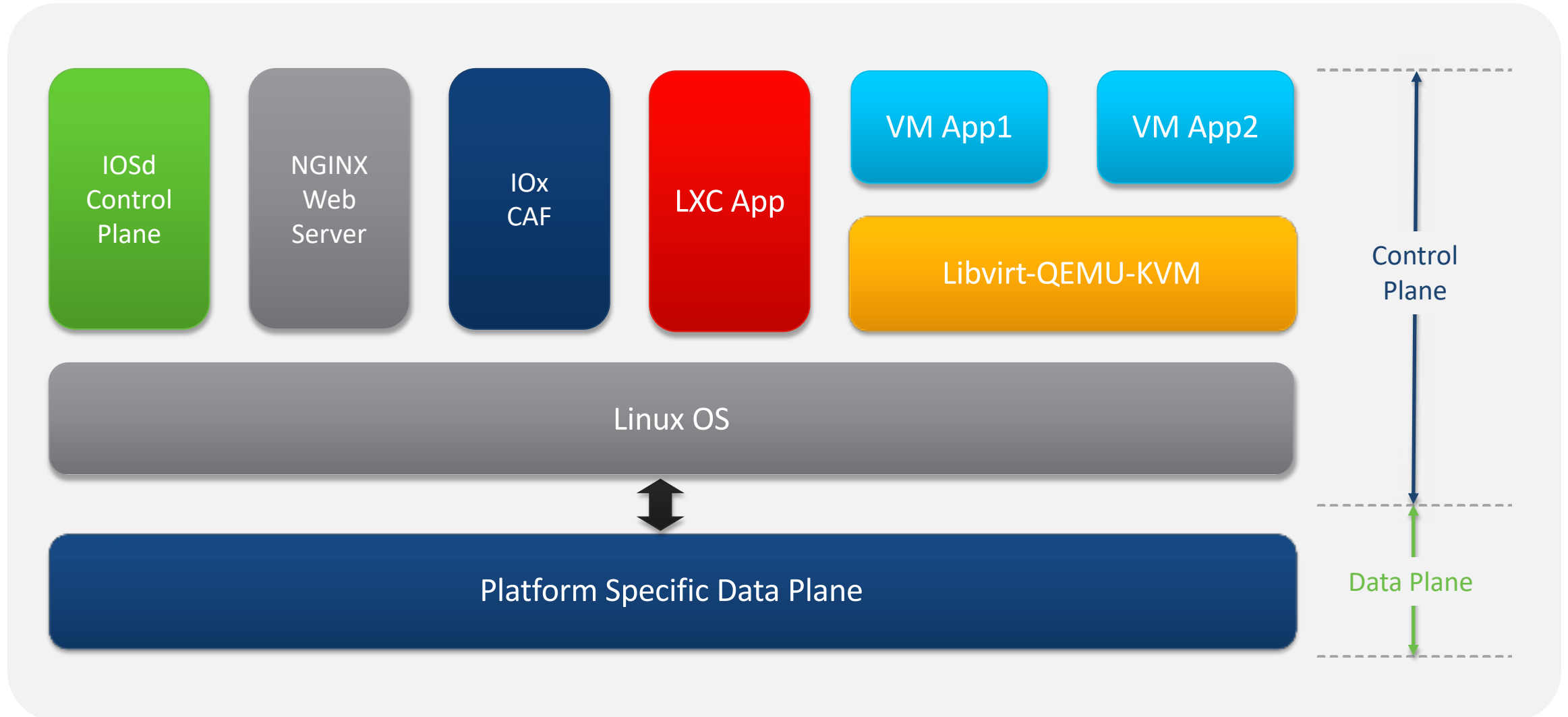
Growing with increase in Data Processing across Industries



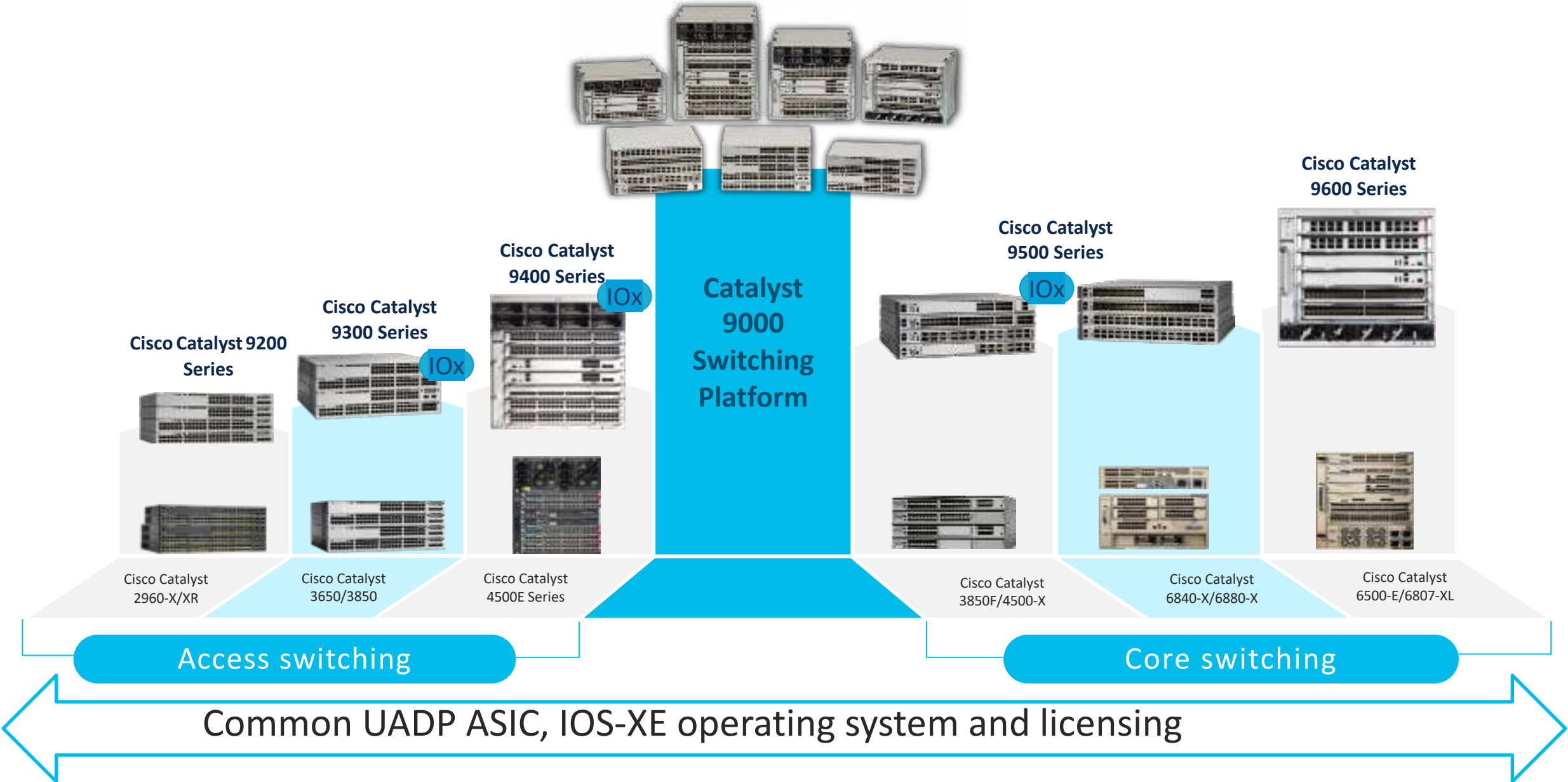
What is Cisco IOx today?

- **IOS** and Linux = **IOx**
- Cisco IOx is an application **hosting** environment
- Hosts **Virtual Machines** as well as **Containers**
- Supports **docker** tooling for development
- Provisions **services** like GPS & Secure Storage, for applications
- **Local Manager** for application monitoring and resource usage
- **APIs** for Application Management (GMM, FND, FD, DNA-C,...)

App-hosting Architecture Overview

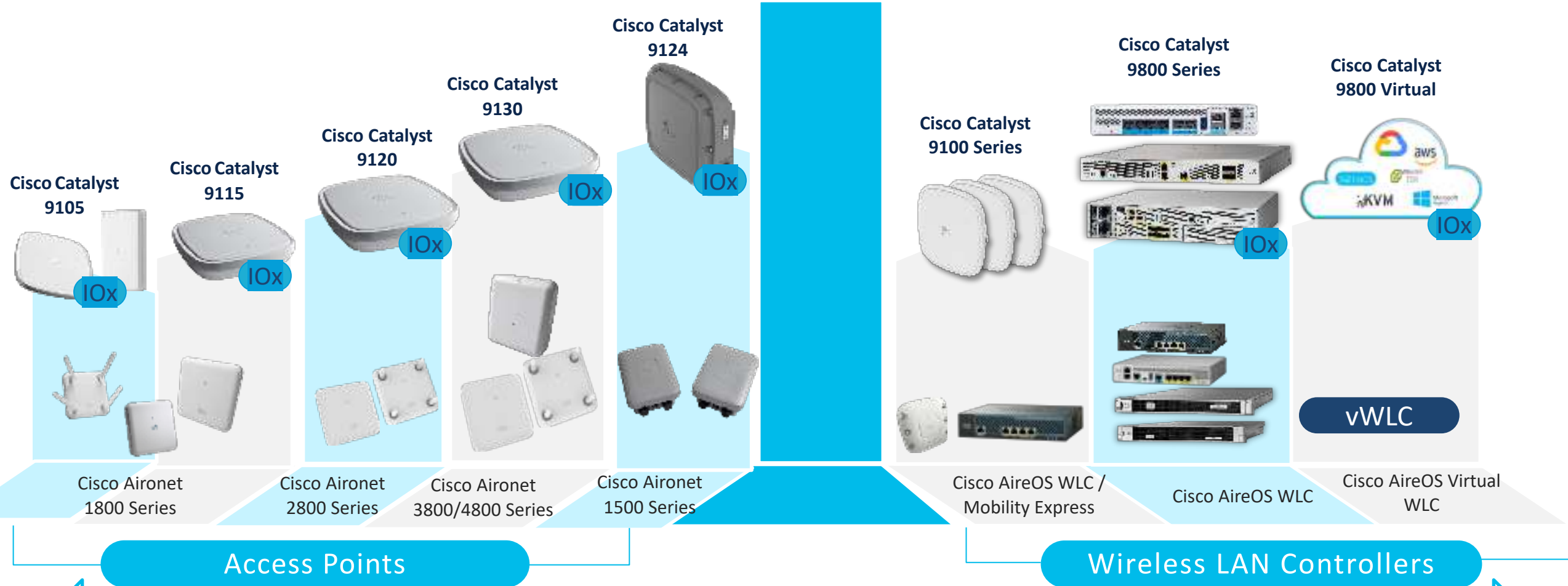


Catalyst Switching - Fully Refreshed Portfolio



Catalyst Wireless - Fully Refreshed Portfolio

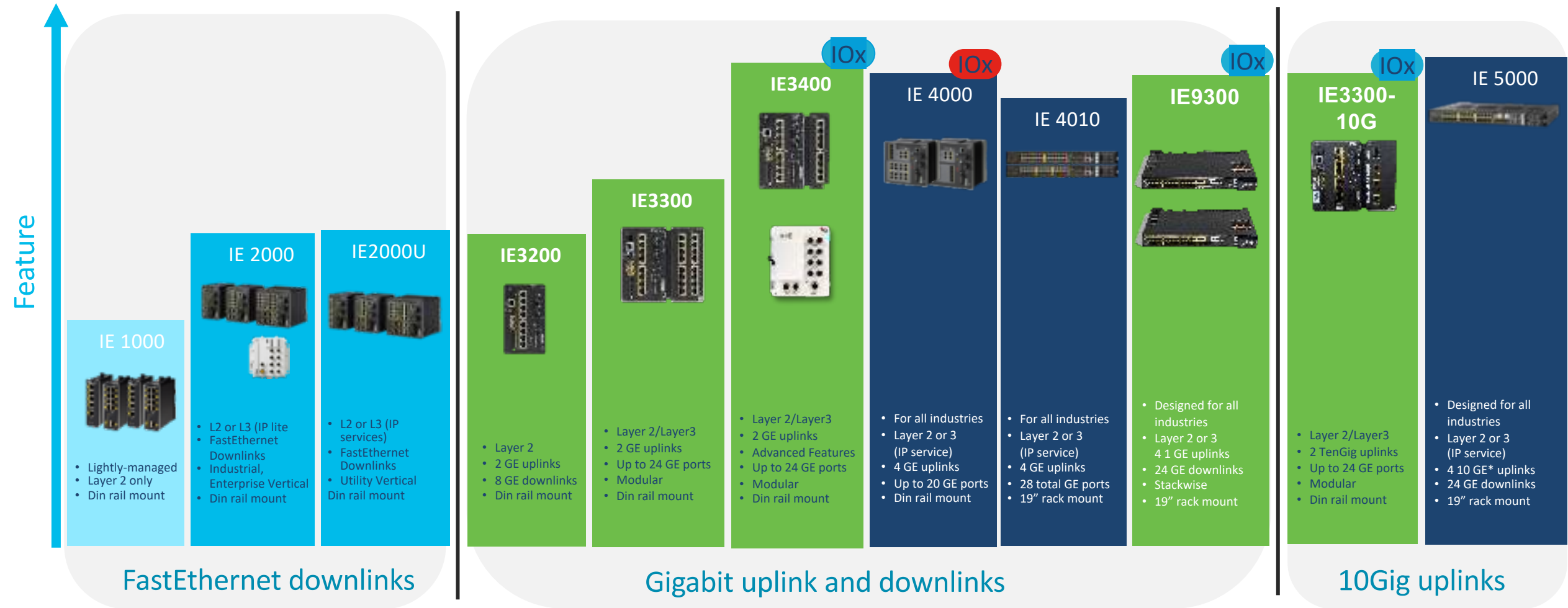
Catalyst 9000 Wireless Platform



Common IOS-XE operating system and licensing

IoT Industrial Switching portfolio

IOS-XE
IOS - IOS
Non IOS



IE3400H has FE Model too

** –Selected Models

A complete routing portfolio

Secured and optimized for *every* use case



IOx

ISR 4000



IOx

ASR 1000

Demanding, mission critical deployments

Fleet, first-responders, pipelines



IOx



Catalyst
IR1800

- Wi-Fi 6, LTE/5G
- Gigabit Ethernet & POE
- Automotive Dead Reckoning GNSS
- CAN-Bus
- Transportation certified

Remote monitoring,
streetlights, intersections



IOx



Catalyst
IR8100

- IP67 rated
- Battery backup
- Ethernet & PoE or PoE+*
- Modular power supply unit and CPU
- Utility certified

ATMs, low voltage substations,
roadside equipment



IOx



Catalyst
IR1100

- Compact, for space constrained deployment
- Low power
- LTE/5G/DSL, Ethernet
- Utility certified

Factory, high voltage substations



IOx



Catalyst
IR8300

- Routing & Switching Includes advanced switching powered by Cisco silicon
- U-PoE up to 60 watts
- Precision timing source
- Utility certified

High volume Simple m2m deployments

Kiosks, vending machines,
coffee machines

IG21R, IG31R



IG20

Cisco IoT Gateway (IG)

- Cloud-first, cost-effective
- Deployment with no staging required
- Indoor & ruggedized versions

*roadmap item

IOx Hardware Platforms Summary

	IC3000	IR809 / IR829	IR1101	IE3400	IE4000
CPU	Intel Atom C2508 4-Core Rangeley, 1.2 GHz	Intel Atom C2308 2-Core Rangeley, 1.2GHz	Marvell Armada 4-Core A72 @ 600MHz	Zynq UltraScale+ 4-Core A53, 1.2GHz	AppliedMicro APM86392 PowerPC4 465 600Mhz
CPU Arch	x86_64	x86_64	aarch64	aarch64	ppc
CPU Units	10260	732	1255	1400	1035
OS	specific firmware	Cisco IOS	Cisco IOS-XE	Cisco IOS-XE	Cisco IOS
RAM Usable	8GB DDR3 1333Mhz	767MB DDR3 1333Mhz	862 MB DDR4 ECC	4GB DDR4	512MB
IOx Application Storage	96GB SSD disk	512MB - 1.8GB 40GB-80GB with SSD disk	700 MB or 65GB with SSD	4GB eMMC partition shared with IOS-XE	256MB flash
LXC Containers	No	Yes	Yes	No	Yes
Docker Compatible (can run Docker images)	Yes	Yes	Yes	Yes	Yes
Docker Runtime (runs Docker engine)	Yes	No (never)	Yes	Yes	No
Remote Docker Workflow	Yes	No	IOS-XE 17.3.1 July 2020	IOS-XE 17.3.1 July 2020	No
Virtual Machines	Yes	No	No	No	No
USB	Storage, Serial	Storage, Serial	-	-	Storage; Serial
Use Cases	Faster compute Paired with non-IOx Capable gear	RaMA with LTE 829: In vehicle, wifi	Modular LTE Serial ports	Manufacturing Road infra	Legacy Last IOS release with IOx: 15.2(7a)E0b

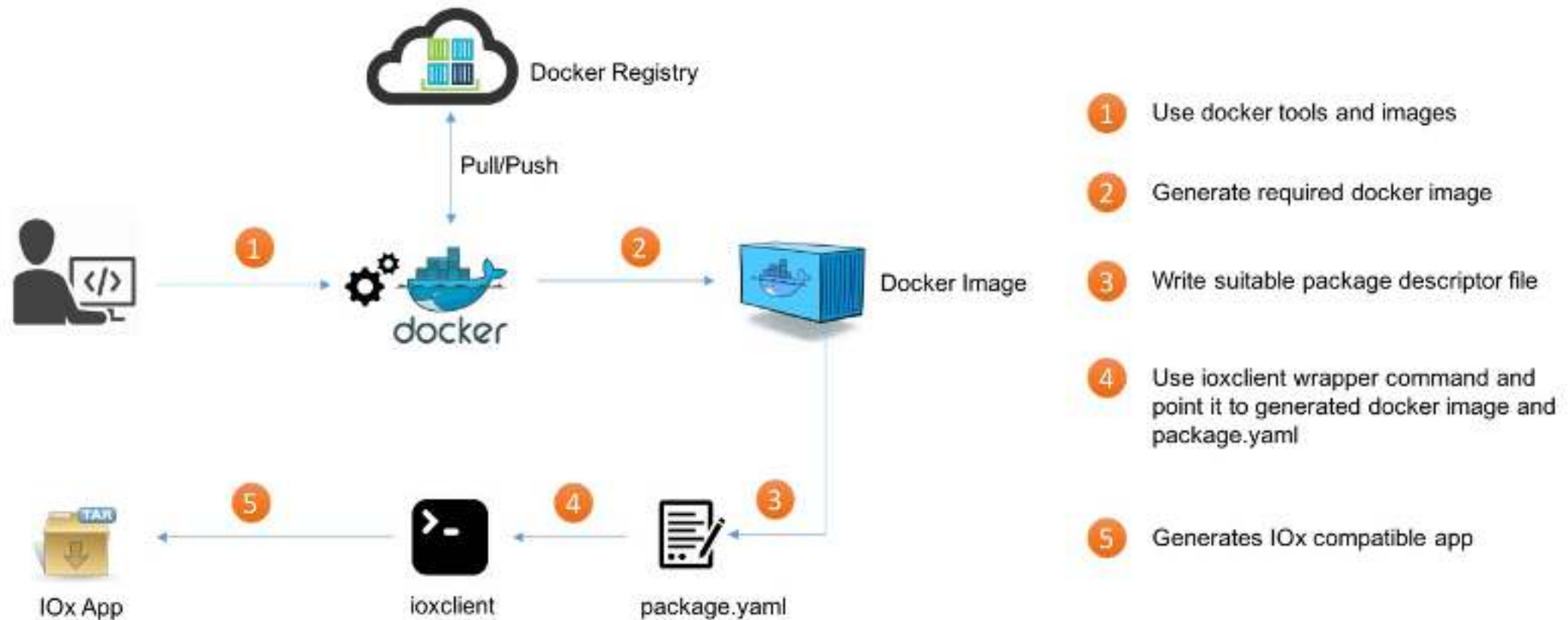
IOx Hardware Platforms Summary

	Catalyst 9000	ASR1000	ISR4000	CGR1000 Compute Module
CPU	Intel	Intel	Intel	AMD GX-410VC. 4-Core @ 800Mhz
CPU Arch	x86_64	x86_64	x86_64	x86_64
CPU Units	7400	73000	13000	7318
OS	Cisco IOS-XE	Cisco IOS-XE	Cisco IOS-XE	Cisco IOS
RAM Usable	4GB+	4GB+	4GB+	4GB
Application Storage	120-960GB SSD disk	40-400GB SSD	20-200GB SSD	50 - 100GB SSD
LXC Containers	No	Yes	Yes	Yes
Docker Compatible	Yes	Yes	Yes	Yes
Docker Native	Yes (16.12+)	No	No	no
Virtual Machines	No	Yes	Yes	Yes
Use Cases	Core Network Telemetry	Edge network telemetry	Edge network telemetry	Adds IOx to existing Connected Grid Routers (CGR)

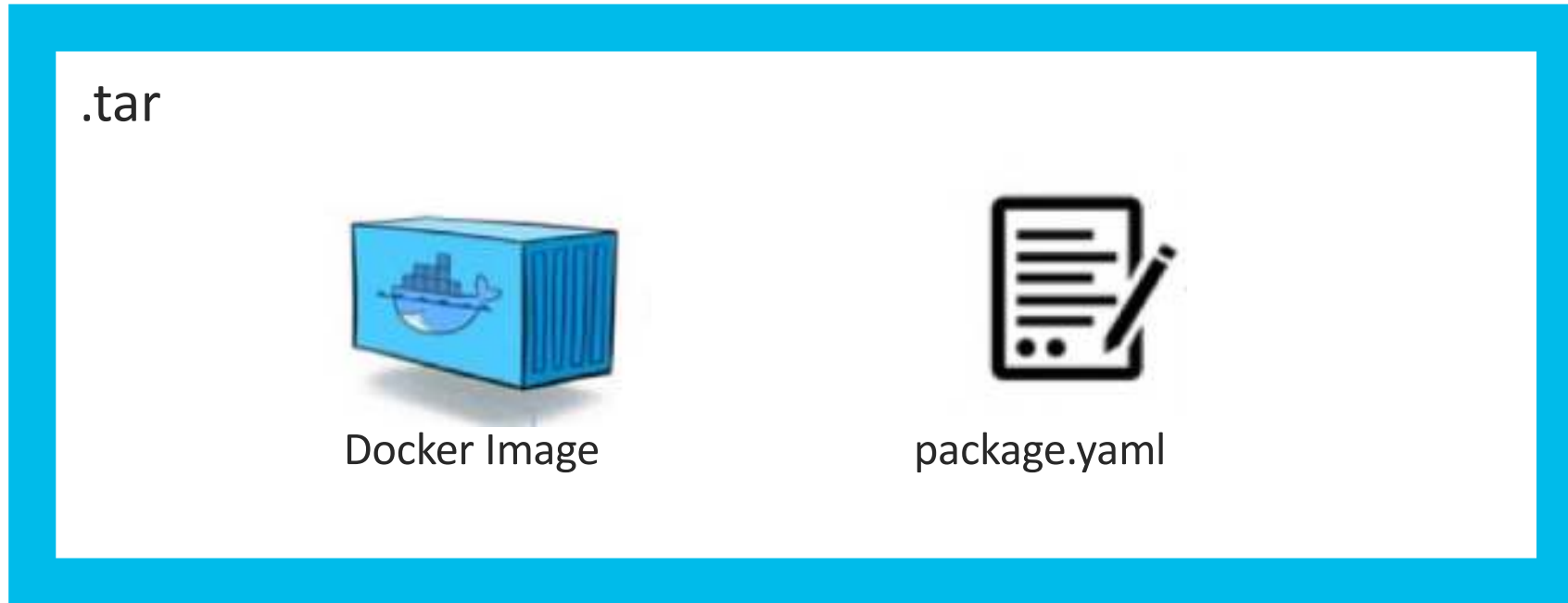
DevNet IOx Platform Matrix: <https://developer.cisco.com/docs/iox/#!platform-support-matrix/platform-support-matrix>

DevNet IOx feature support matrix: <https://developer.cisco.com/docs/iox/#!feature-compatibility-matrix>

Using the Docker tool chain to generate IOx applications



Docker Application Anatomy for IOx



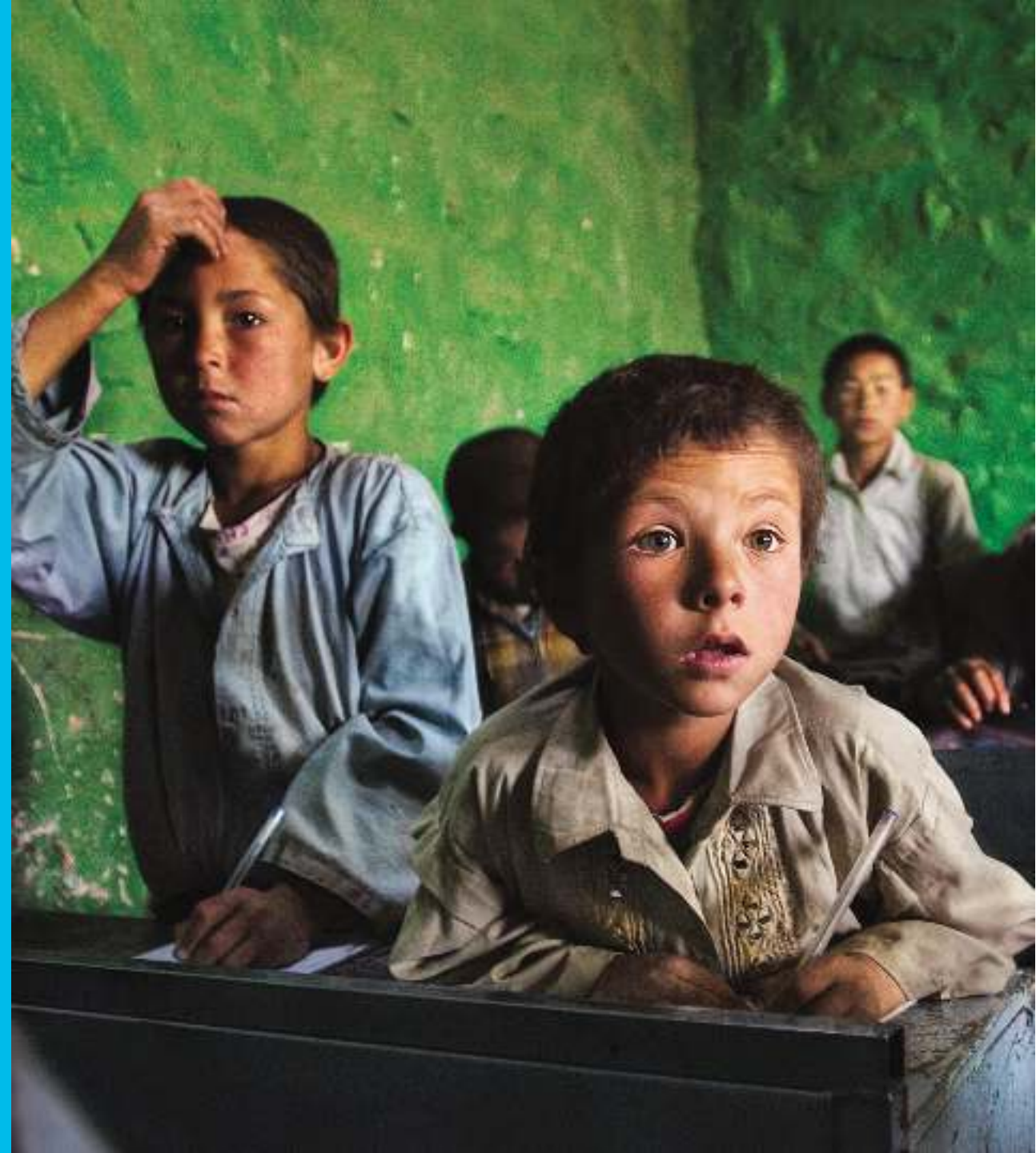
- Cross compilation for different platforms is still needed

Package Anatomy

IOx application package is a tarball containing the following files:

File	Description
package.yaml	Application Descriptor, user-generated, optional with Docker
package.mf	Manifest file containing the checksum of the other files at this level. Automatically generated by ioxclient
artifacts.tar.gz	auto-generated compressed envelope containing a tar ball of docker image

Příklady nasazení



#1 Nasazení vlastní aplikace

Define the Dockerfile

```
FROM python:3-alpine
```

tells Docker to build a container image based on the publicly-available Alpine Linux 3.9 image

```
RUN apk add --update \  
python3  
RUN pip3 install bottle
```

RUN instruction installs Python3, then uses the pip3 tool to install the bottle web framework.

```
EXPOSE 8000
```

EXPOSE instruction configures the created container to listen on port 8000.

```
COPY main.py /main.py
```

COPY instruction copies the main.py file to the root of the container filesystem.

```
CMD python3 /main.py
```

CMD instruction executes the main.py file using the Python 3 interpreter. This instruction is necessary only when running the container locally for testing.

Create your code (main.py)

- Uses the “bottle” framework to create a web server
- Binds the root URL to a message
- Listens to connections on port 8000

```
from bottle import route, run

@route('/')
def hello():
    return '<b>Hello Cisco</b>!'

run(host='0.0.0.0', port=8000)
```

Build the Docker image

- Build docker image

```
docker build -t dosoukup/iox-test .
```

- Check build success

```
docker images
```

```
dosoukup@DOSOUKUP-M-21HW techclub % docker images
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
dosoukup/iox-test	latest	0dca3ec50059	8 seconds ago	102MB

Save Docker image

- Save docker image

```
docker save dosoukup/iox-test:latest -o demo.tar
```

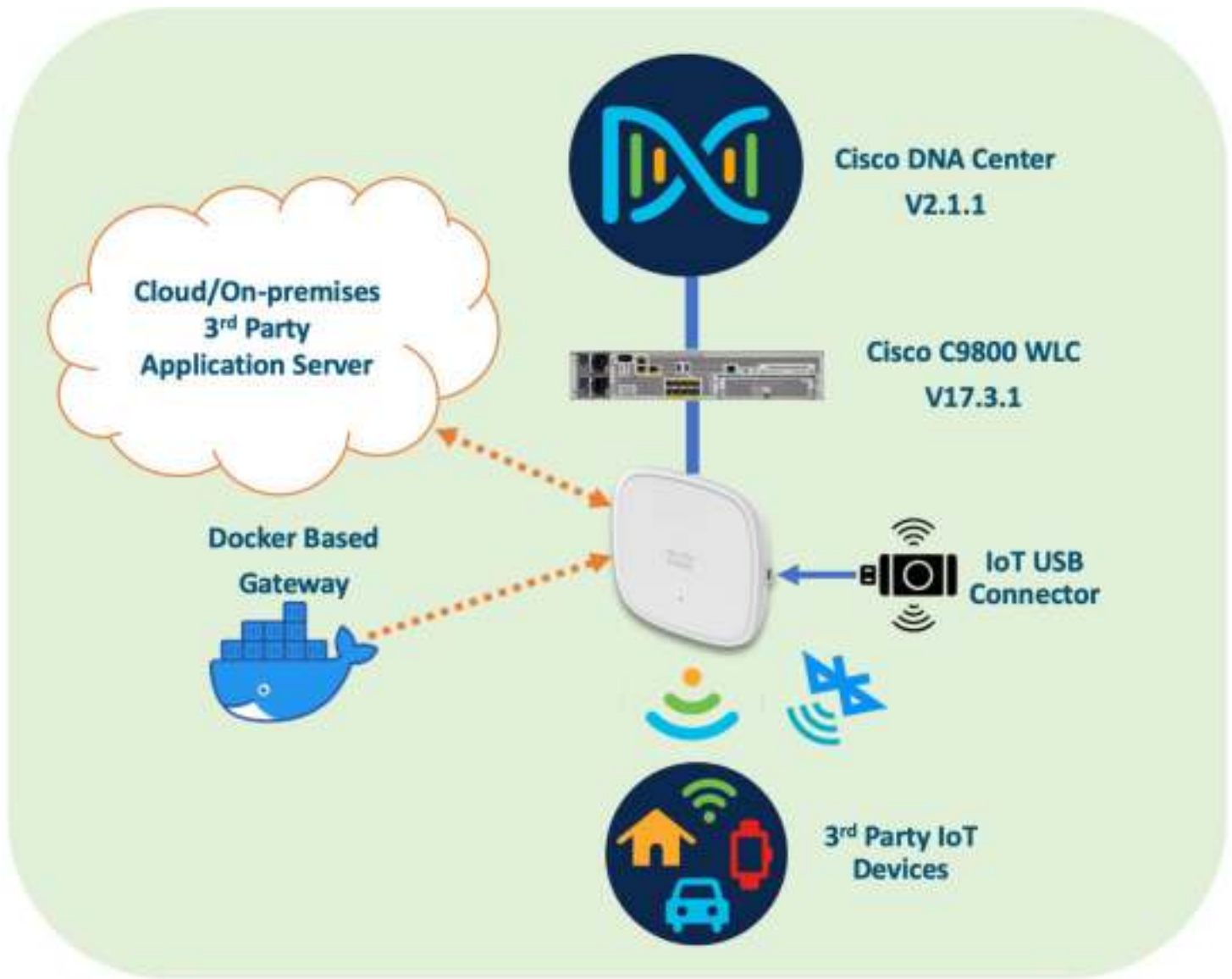
- Check success

```
ls -lt
```

```
dosoukup@DOSOUKUP-M-21HW techclub % ls -lt
total 285520
-rw-----  1 dosoukup  staff  107825664 Apr 25 15:48 demo.tar
```


Non-native Docker Platforms / Non x86





[More Details on DevNet](#)

Define the Dockerfile

```
FROM devhub-docker.cisco.com/iox-docker/ir1101/base-rootfs:latest
```

```
RUN opkg update && opkg install python
```

```
... Same as before ...
```

Build the Docker image

- Build docker image

```
docker build -t iox-hello-py.
```

- Check build success

```
docker images
```

```
dosoukup@DOSOUKUP-M-21HW techclub % docker images
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
iox-hello-py	latest	cf79d48b327a	2 hours ago	28.6MB
dosoukup/iox-test	latest	0dca3ec50059	3 hours ago	102MB

package.yaml

```
descriptor-schema-version: "2.10"
info:
  name: My-app-name
  description: "Simple Hello World Application"
  version: "1.0"
  author-link: "http://www.cisco.com"
  author-name: "Cisco Systems"
app:
  cpuarch: aarch64
  type: docker
  resources:
    profile: c1.tiny
    network:
      -
        interface-name: eth0
        ports:
          tcp:
            - 8000
  startup:
    rootfs: rootfs.img
    target: ["/usr/local/bin/python3", "main.py"]
```

- Contains the configuration information needed to package and run the IOx application
- YAML is a markup language that in IOx uses to store configuration information about the application package.

Save Docker image

- Save docker image and create IOx package

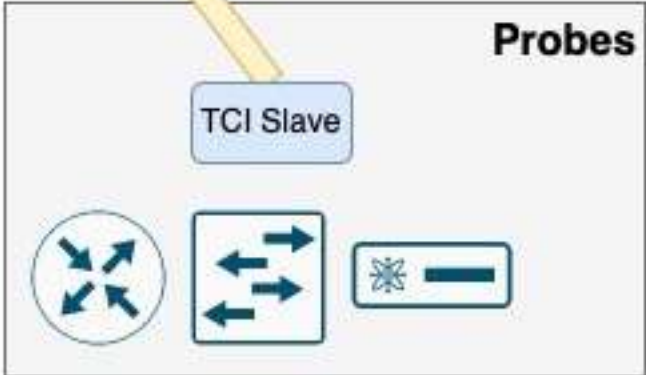
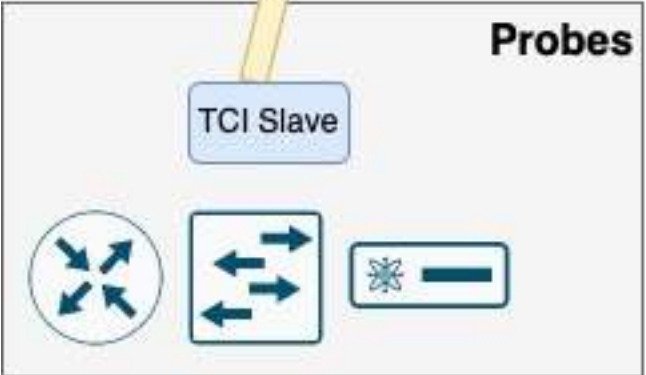
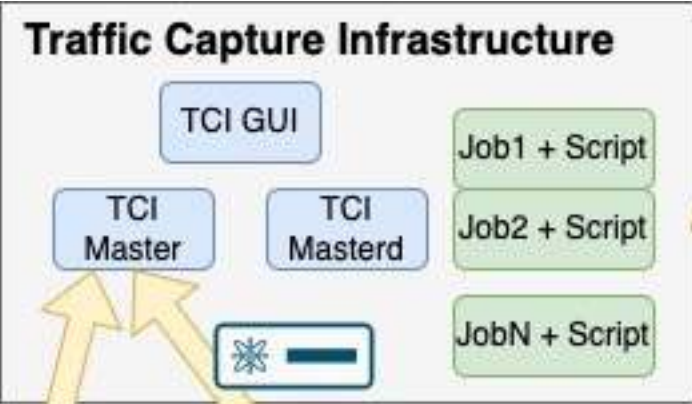
```
sudo ioxclient docker package -p ext2 iox-hello-py
```

- Check success

```
ls -lr
```

```
(base) dosoukup@dosoukup-virtual-machine:~/Devnet/ap-iox-app/conf$ ls -lt
total 9124
-rw-r--r-- 1 root    root    4666880 dub 25 16:03 package.tar
```

#2 Sběr síťových dat



Created By 
 [Repository](#)

#3 Monitoring a troubleshooting

IOS XE Programmability

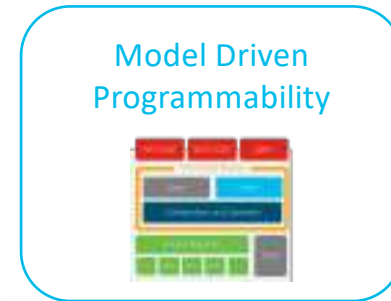
Pre-boot Execution Environment

Zero Touch Provisioning

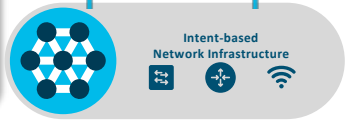
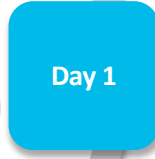
Plug and Play



Device Onboarding



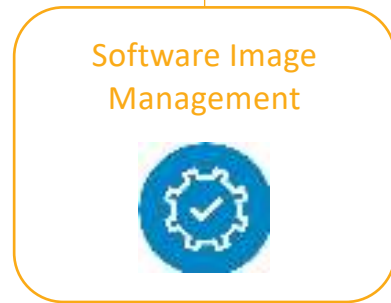
Device Configuration



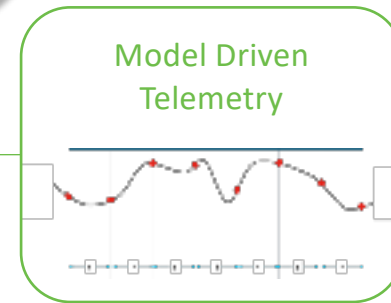
INTENT

CONTEXT

Device Optimization



Device Monitoring



Network Configuration Protocol (NETCONF)

RESTCONF

YANG Data Models

gNMI + OpenConfig

Guest Shell

On-Box Python

Application Hosting

gNMI Dial-In

gRPC Dial-Out

NETCONF Dial-Out

Python Modules - API

3 Python modules are available that are the API between Guest Shell and the IOS XE device:

- cli.cli, cli.clip
- cli.execute, cli.executep
- cli.configure, cli.configurep

```
print "\n\n *** Sample ZTP Day0 Python Script *** \n\n"
# Importing cli module
import cli

print "Configure vlan interface, gateway, aaa, and enable netconf-yang\n\n"
cli.configurep(["int vlan 1", "ip address 10.5.123.27 255.255.255.0", "no shut", "end"])
cli.configurep(["ip default-gateway 10.5.123.1", "end"])
cli.configurep(["username admin privilege 15 secret 0 cisco123"])
cli.configurep(["aaa new-model", "aaa authentication login default local", "end"])
cli.configurep(["aaa authorization exec default local", "aaa session id common", "end"])
cli.configurep(["netconf-yang", "end"])

print "\n\n *** Executing show ip interface brief *** \n\n"
cli_command = "sh ip int brief"
cli.executep(cli_command)

print "\n\n *** ZTP Day0 Python Script Execution Complete *** \n\n"
```

1. cli.cli(command) —This function takes an IOS command as an argument, runs the command through the IOS parser, and returns the resulting text.

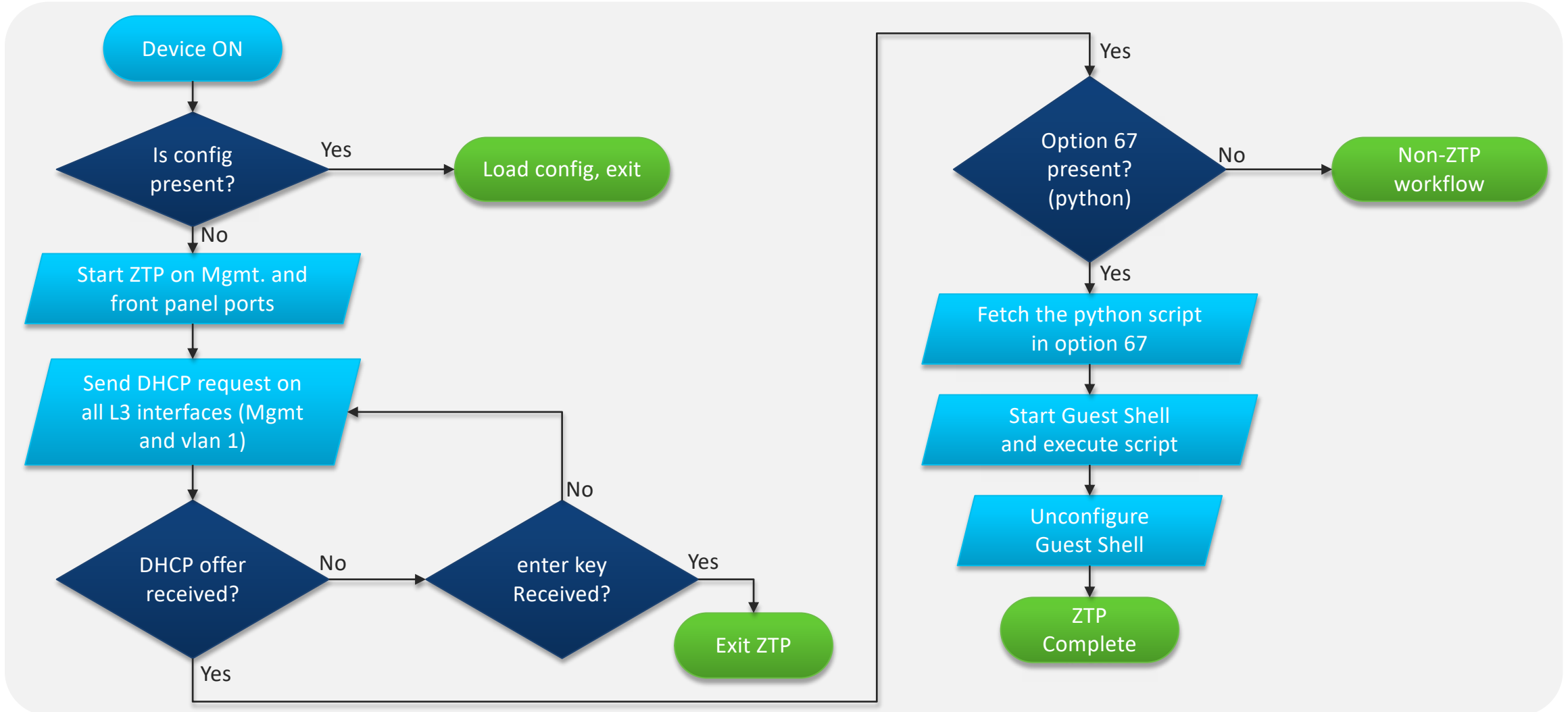
2. cli.execute(command) —This function executes a single EXEC command and returns the output; however, does not print the resulting text. No semicolons or newlines are allowed as part of this command. Use a Python list with a for-loop to execute this function more than once.

3. cli.configure(command) —This function configures the device with the configuration available in commands. It returns a list of named tuples that contains the command and its result

4, 5, 6: cli.{cli, execute, configure}p(command) — This function works exactly the same as the other functions, except that it prints the resulting text to *stdout* rather than returning it .

ZTP Workflow using Guest Shell

For your Reference



Tools Overview

- [Wireless Config Analyzer Express – WCAE](#)
- [Wireless Debug Analyzer](#)
- [9800 Guestshell/EEM scripts](#)
- [WiFi HAWK](#)

Wireless Troubleshooting - Automation

Why?	What?
<p>Efficient Client Troubleshooting</p> <p>Wireless client troubleshooting requires lots of iterations to collect right information. This tool will help us to do all those steps in one shot, saving time and ensuring we get correlated logs and captures from 9800 WLC using Guestshell & Python Innovation.</p>	<ul style="list-style-type: none">▪ Automatic client RA traces, Packet Captures, & Summary of events using Guestshell python scripts▪ Enabled on Multiple WLCs to capture IRCM▪ DNAC : MRE workflow integration completed by Eng
<p>Uninterrupted Embedded Packet Capture</p> <p>This tool will help to export packet capture buffer to a server without having to start and stop the capture, allowing to have continuous packet capture stored in server with different filenames to do forensic analysis with all the packets.</p>	<ul style="list-style-type: none">▪ Configure & Export rotatory packet capture on 9800 using Guestshell▪ Continuous captures help when issue is random & Sporadic in nature▪ MRE Workflow integration work in progress
<p>Automated Archive request and export</p> <p>Based on recent learnings we need to enable verbose traces for complete 9800. This tool will help us to automate periodical archive traces and exports without requiring customer intervention.</p>	<ul style="list-style-type: none">▪ Configure & Export Archive traces from 9800 using EEM▪ Periodical & timed log capture for efficient troubleshooting▪ MRE Workflow integration work in progress
<p>KPI Collector</p> <p>This tool will help to automate data collection (KPI or Action Plan), ensures we have the right data collected</p>	<ul style="list-style-type: none">▪ Run a set of commands and store info in the file using Python & Guestshell▪ Tool will be able to collect outputs several times to monitor counter & Other KPI stats▪ MRE Workflow integration work in progress

Key 9800 KPIs

AP Name	Ethernet MAC	Radio MAC	AP Up Time	Association Up Time
RDK_01	2c57.4188.4260	cc7f.75ad.e1a0	9 days 23 hours 47 minutes 12 seconds	22 hours 48 minutes 54 seconds
GBATRH17Z02A003	2c57.4152.6208	1416.9d83.0c80	50 days 7 hours 26 minutes 58 seconds	20 hours 36 minutes 8 seconds
GBATRH12Z05A005	2c57.4186.3c50	1416.9ddf.7760	18 hours 3 minutes 50 seconds	18 hours 1 minute 17 seconds
GBATRH18Z01A008	2c57.4188.4f74	cc7f.75a8.9660	18 hours 1 minute 42 seconds	17 hours 59 minutes 2 seconds
GBATRH09Z01A009	2c57.4152.2ce0	1416.9d52.fce0	15 hours 26 minutes 54 seconds	15 hours 24 minutes 23 seconds
GBATRH20Z12A004	2c57.4152.6098	1416.9d83.0100	11 hours 56 minutes 45 seconds	11 hours 54 minutes 17 seconds
GBNECEXTGH2A001	1416.9d82.401c	548a.ba7f.9340	98 days 20 hours 2 minutes 2 seconds	3 hours 17 minutes 25 seconds
GBATRH19Z05A003	2c57.4152.62d0	1416.9d83.12c0	3 days 1 hour 19 minutes 1 second	2 hours 41 minutes 51 seconds
GBATRH19Z08A003	2c57.4152.60fc	1416.9d83.0420	2 hours 44 minutes 4 seconds	2 hours 41 minutes 26 seconds
GBATRH08Z02A005	2c57.4152.2afc	1416.9d52.edc0	16 hours 0 minute 45 seconds	2 hours 40 minutes 50 seconds
GBATRH08Z01A001	2c57.4152.5a94	1416.9d82.d0e0	8 hours 50 minutes 38 seconds	2 hours 39 minutes 0 second
GBATRH08Z02A003	2c57.4152.2608	1416.9d52.c620	1 day 1 hour 38 minutes 45 seconds	2 hours 25 minutes 36 seconds
GBATRH08Z02A001	2c57.4152.2a8c	1416.9d52.ea40	17 hours 52 minutes 45 seconds	2 hours 10 minutes 32 seconds
GBATRH08Z01A002	2c57.4188.5318	cc7f.75ab.fbe0	1 day 3 hours 31 minutes 41 seconds	2 hours 8 minutes 12 seconds
GBATRH08Z01A003	2c57.4152.5aa8	1416.9d82.d380	4 days 4 hours 7 minutes 46 seconds	2 hours 8 minutes 7 seconds
GBATRH08Z04A002	2c57.4152.2ac4	1416.9d52.ec00	6 hours 52 minutes 44 seconds	2 hours 6 minutes 56 seconds
GBATRH08Z02A004	2c57.4152.29e8	1416.9d52.e520	6 hours 22 minutes 49 seconds	2 hours 6 minutes 18 seconds
GBATRH08Z01A007	2c57.4152.2adc	1416.9d52.ecc0	2 hours 17 minutes 46 seconds	2 hours 3 minutes 45 seconds
GBATRH08Z03A001	2c57.4152.5814	1416.9d82.bce0	18 hours 14 minutes 37 seconds	2 hours 2 minutes 51 seconds
GBATRH08Z01A004	2c57.4188.4e7c	cc7f.75a8.8ea0	2 hours 55 minutes 40 seconds	2 hours 2 minutes 50 seconds
GBATRH08Z03A003	2c57.4188.5320	cc7f.75ab.fc20	5 hours 46 minutes 50 seconds	2 hours 2 minutes 43 seconds
GBATRH08Z01A009	2c57.4152.2b00	1416.9d52.ede0	2 days 21 hours 4 minutes 45 seconds	1 hour 59 minutes 1 second
GBATRH08Z03A002	2c57.4188.52c8	cc7f.75ab.f960	1 day 16 hours 12 minutes 51 seconds	1 hour 57 minutes 43 seconds
GBATRH08Z04A001	2c57.4152.2bb8	1416.9d52.f3a0	14 hours 8 minutes 51 seconds	1 hour 53 minutes 47 seconds
GBATRH08Z01A008	2c57.4152.2b1c	1416.9d52.e0c0	1 day 5 hours 56 minutes 44 seconds	1 hour 50 minutes 59 seconds
GBATRH08Z02A006	2c57.4188.52c4	cc7f.75ab.f940	2 hours 23 minutes 42 seconds	1 hour 50 minutes 59 seconds
GBATRH08Z02A007	2c57.4152.5a40	1416.9d82.ce40	22 hours 10 minutes 47 seconds	1 hour 49 minutes 4 seconds
GBATRH08Z02A002	2c57.4152.2b30	1416.9d52.ef60	4 days 3 hours 43 minutes 38 seconds	1 hour 48 minutes 34 seconds
GBATRH08Z01A006	2c57.4188.5284	cc7f.75ab.f740	18 hours 56 minutes 44 seconds	1 hour 47 minutes 54 seconds
GBATRH08Z01A005	2c57.4188.51d8	cc7f.75ab.f1e0	1 day 17 hours 57 minutes 44 seconds	1 hour 35 minutes 35 seconds
GBATRH06Z07A007	2c57.4152.2638	1416.9d52.c7a0	41 minutes 24 seconds	38 minutes 44 seconds
GBATRH17Z07A005	2c57.4152.6460	1416.9d83.1f40	22 hours 47 minutes 21 seconds	28 minutes 2 seconds
GBATRH09Z01A003	2c57.4152.2678	1416.9d52.c9a0	26 minutes 25 seconds	23 minutes 56 seconds

WiFi-Hawk

- Expert system to identify problems over from a wireless capture
 - Hard to see issues found in huge files
 - Low level protocol analysis
 - Interoperability problems
- Generate a summary of events per client and AP WLANs
- Create Expert reports
- Speed up event identification in a wireless capture



Event Flow

- Color coded events registered per device
- Summary of repeated items for a more concise view
- Quick location in capture of important issues (frame/time)
- Added information for better understanding
- Translation of reason codes, failures, EAP types, etc

Event Flow:								
Direction	Type	Severity	BSSID	Frame	Time	Info		
>>>>>	Probe requests	Info	NA	28669	NA	Consecutive requests:48		
<<<<<<	Probe responses	Info	NA	28617	NA	Consecutive responses:223		
>>>>>	Auth request	Info	64:16:9d:55:5c:f4	28688	Thu, 12 May 2016 11:22:33 CEST	Auth Open System		
<<<<<<	Auth resp success	Info	64:16:9d:55:5c:f4	28690	Thu, 12 May 2016 11:22:33 CEST	Auth Open System		
>>>>>	Assoc request	Info	64:16:9d:55:5c:f4	28693	Thu, 12 May 2016 11:22:33 CEST	Type: 802.1x To SSID:ilo_AKA-Ahmedabad		
<<<<<<	EAP ID request	Info	64:16:9d:55:5c:f4	28701	Thu, 12 May 2016 11:22:33 CEST	Identity request		
>>>>>	EAP ID response	Info	64:16:9d:55:5c:f4	28715	Thu, 12 May 2016 11:22:33 CEST	Identity response		
<<<<<<	EAP request	Info	64:16:9d:55:5c:f4	28802	Thu, 12 May 2016 11:22:33 CEST	EAP-AKA		
>>>>>	EAP response	Info	64:16:9d:55:5c:f4	28880	Thu, 12 May 2016 11:22:33 CEST	EAP-AKA		
>>>>>	EAP response	Info	64:16:9d:55:5c:f4	28883	Thu, 12 May 2016 11:22:33 CEST	EAP-AKA		
<<<<<<	EAP Success	Info	64:16:9d:55:5c:f4	29201	Thu, 12 May 2016 11:22:34 CEST	Dot1x Auth success		
<<<<<<	EAP KEY M	Info	64:16:9d:55:5c:f4	29203	Thu, 12 May 2016 11:22:34 CEST	EAPoL M1		
<<<<<<	EAP Start	Info	64:16:9d:55:5c:f4	29214	Thu, 12 May 2016 11:22:34 CEST	EAP START		
<<<<<<	EAP Start	Info	64:16:9d:55:5c:f4	29219	Thu, 12 May 2016 11:22:34 CEST	EAP START		
<<<<<<	EAP ID request	Info	64:16:9d:55:5c:f4	29221	Thu, 12 May 2016 11:22:34 CEST	Identity request		
<<<<<<	EAP ID request	Info	64:16:9d:55:5c:f4	29223	Thu, 12 May 2016 11:22:34 CEST	Identity request		
>>>>>	Client going to sleep	Info	64:16:9d:55:5c:f4	39809	Thu, 12 May 2016 11:22:53 CEST	Signaling AP that is going to sleep		
>>>>>	Sleep Time	Warning	NA	48017	NA	Client slept for more than 0:00:12 seconds		
>>>>>	Sleep Time	Warning	NA	49805	NA	Client slept for more than 0:00:03 seconds		
>>>>>	Sleep Cycles	Info	NA	NA	NA	Consecutive sleep-awake cycles:2		
>>>>>	Client awake	Info	64:16:9d:55:5c:f4	49805	Thu, 12 May 2016 11:23:08 CEST	Signaling AP that is going to sleep		

#4 Řízení bezdrátových senzorů

Application Hosting on Cisco Catalyst Access Points

4 pillars to enable enterprise IoT use cases



AP as an IoT development platform

Simplified application management



Wi-Fi and IoT convergence

Ecosystem of IoT applications



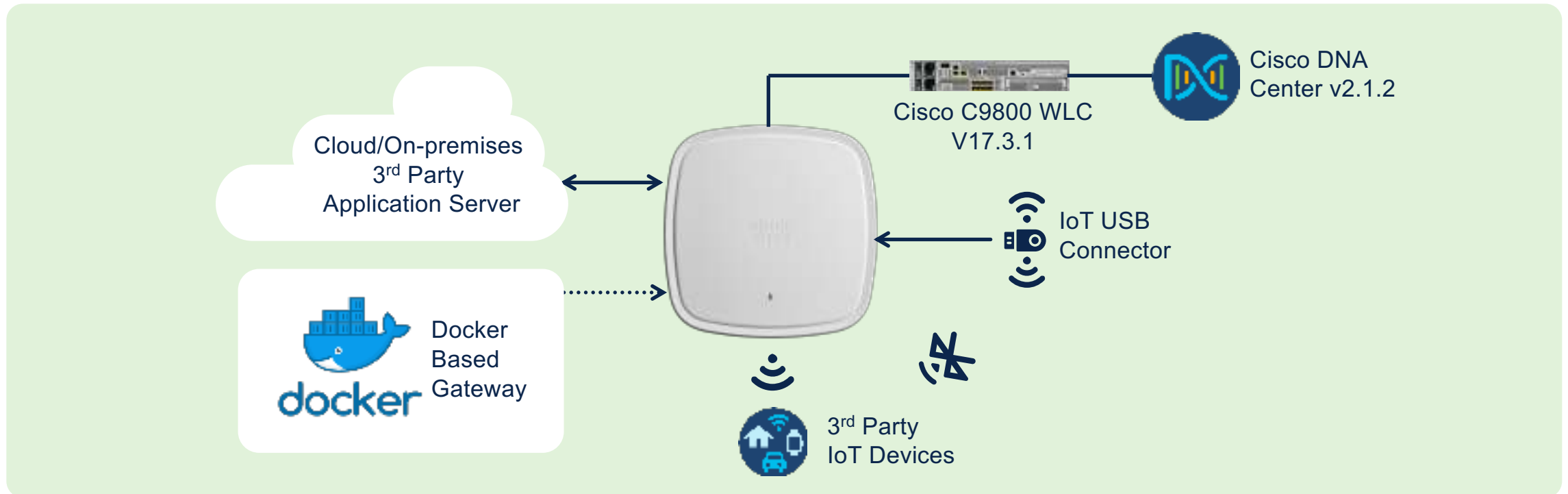
Available in all Cisco® Catalyst® 9100 Access Points

IOx Application Hosting general topology

Cisco DNA Center's role is to manage the deployment of the IOx applications on the APs

IoT USB connector is being depicted as a Bluetooth module but can be any supported module

Catalyst AP is being used as an IoT gateway for the IOx application to communicate with IoT devices



Enabling business outcomes across industries



Asset Management

Locate valuable assets in real-time and monitor asset utilization



Room finding

Find, navigate to and schedule available conference rooms



Employee Safety

Keep employees safe with real time notifications & location updates



Environmental Monitoring

Monitor environmental conditions for sensitive assets and zones



Space Utilization

Allocate space based on occupancy and right-size your real estate portfolio



Work in Progress Tracking

Manage and track workflows for optimal efficiency and monitoring

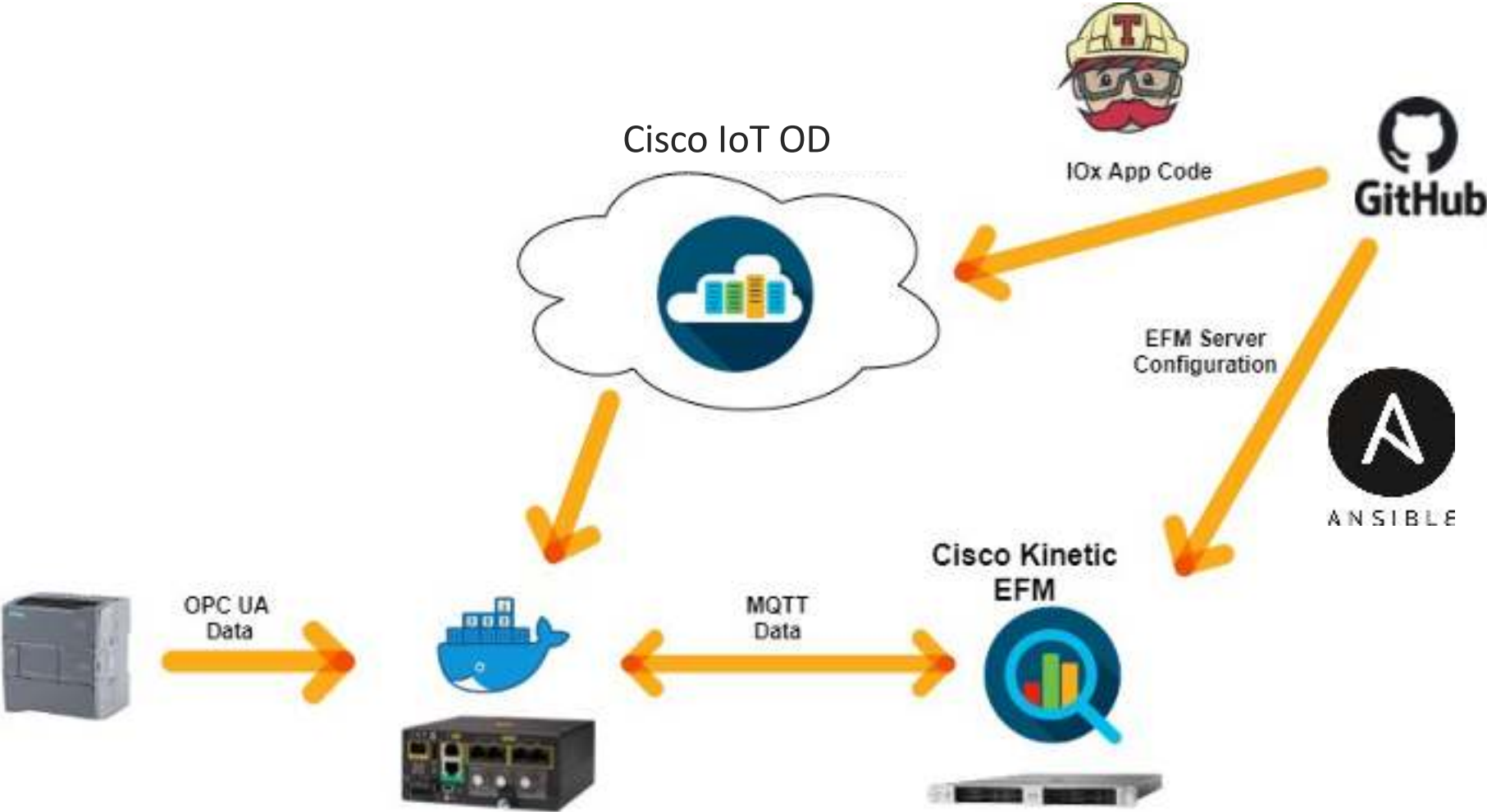


#5 Předzpracování dat

Původní stav



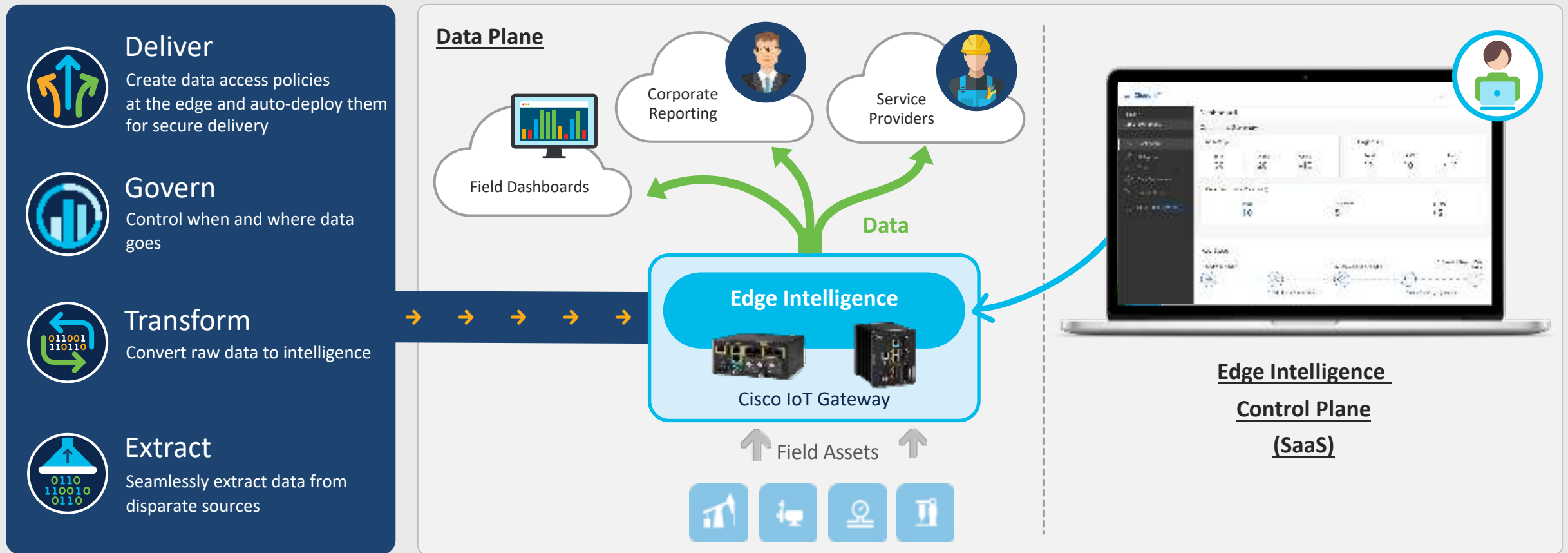
Travis CI & Ansible



#5 Cisco aplikace

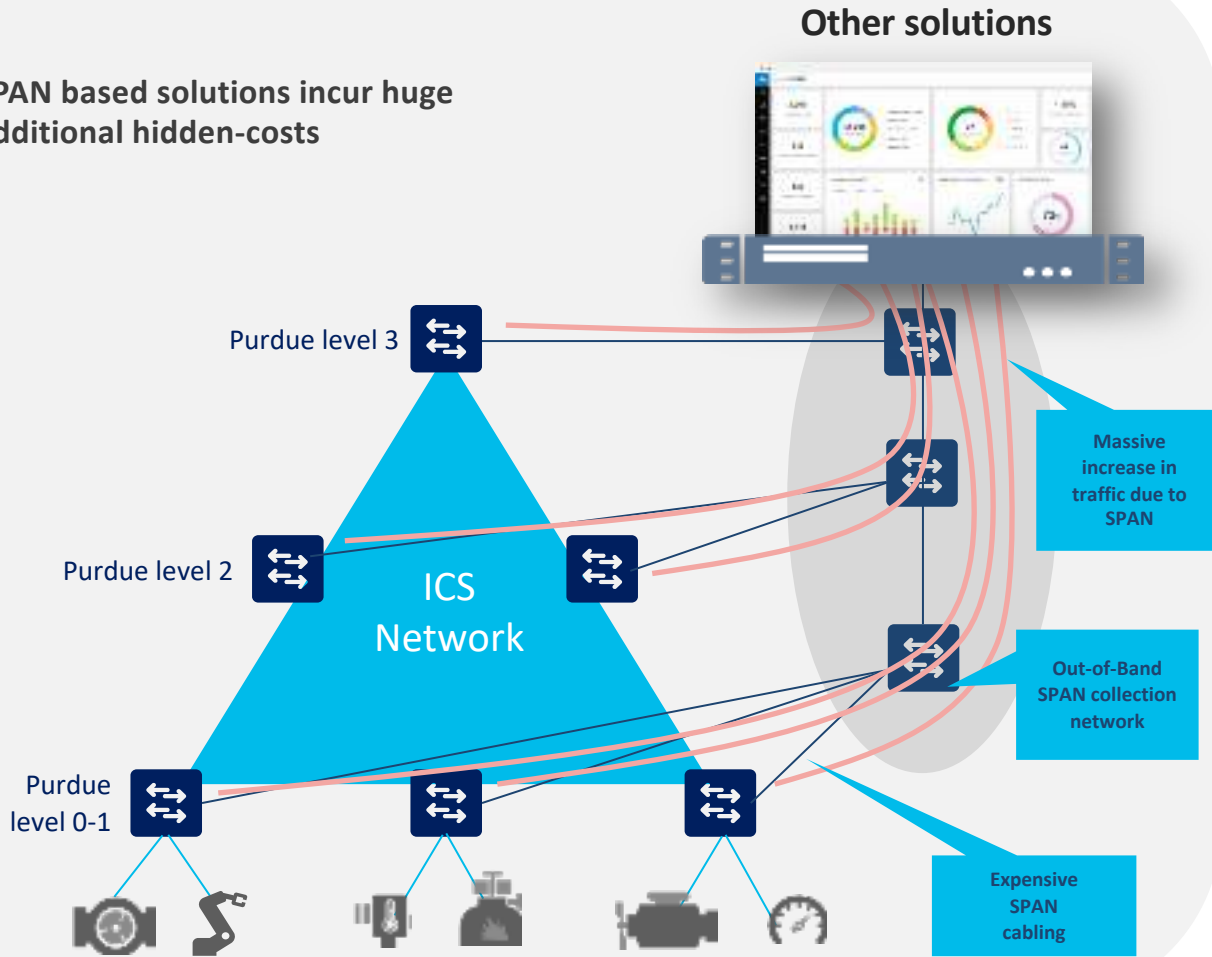
Cisco Edge Intelligence

Plug & play software that simplifies data transformation and orchestration from edge to multi-cloud destinations for immediate realization of business value - Comes fully integrated with Cisco IoT hardware and IOS

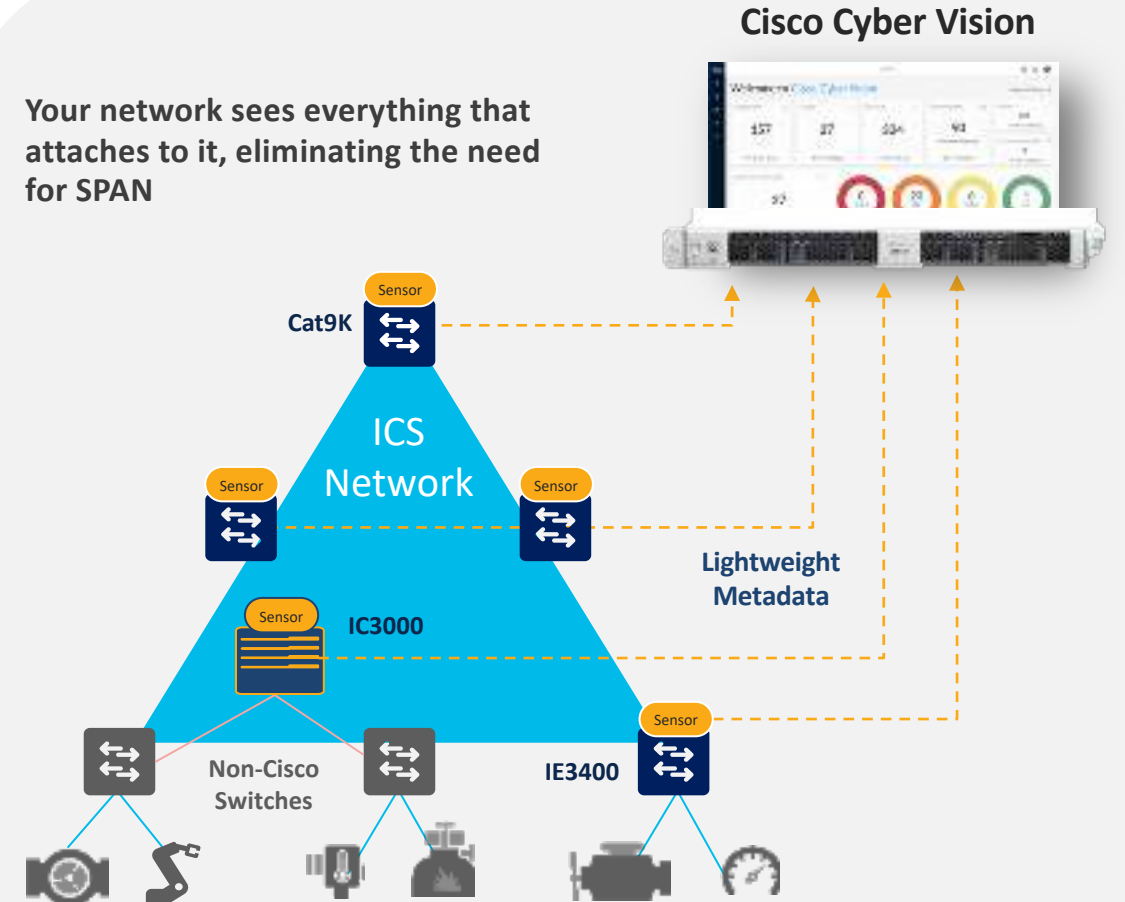


Building a scalable IoT/OT security architecture

SPAN based solutions incur huge additional hidden-costs



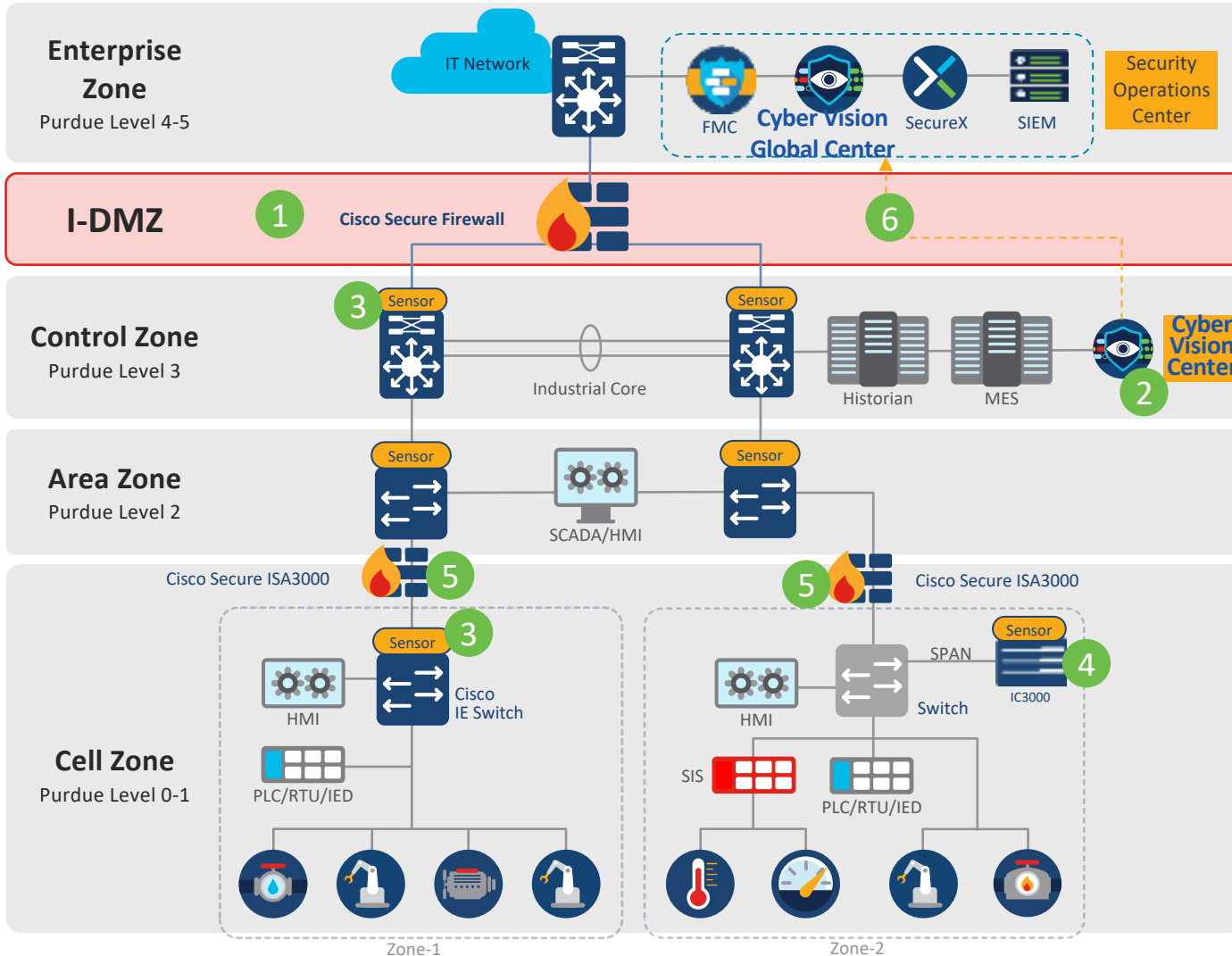
Your network sees everything that attaches to it, eliminating the need for SPAN



Cisco Cyber Vision in Manufacturing

IT

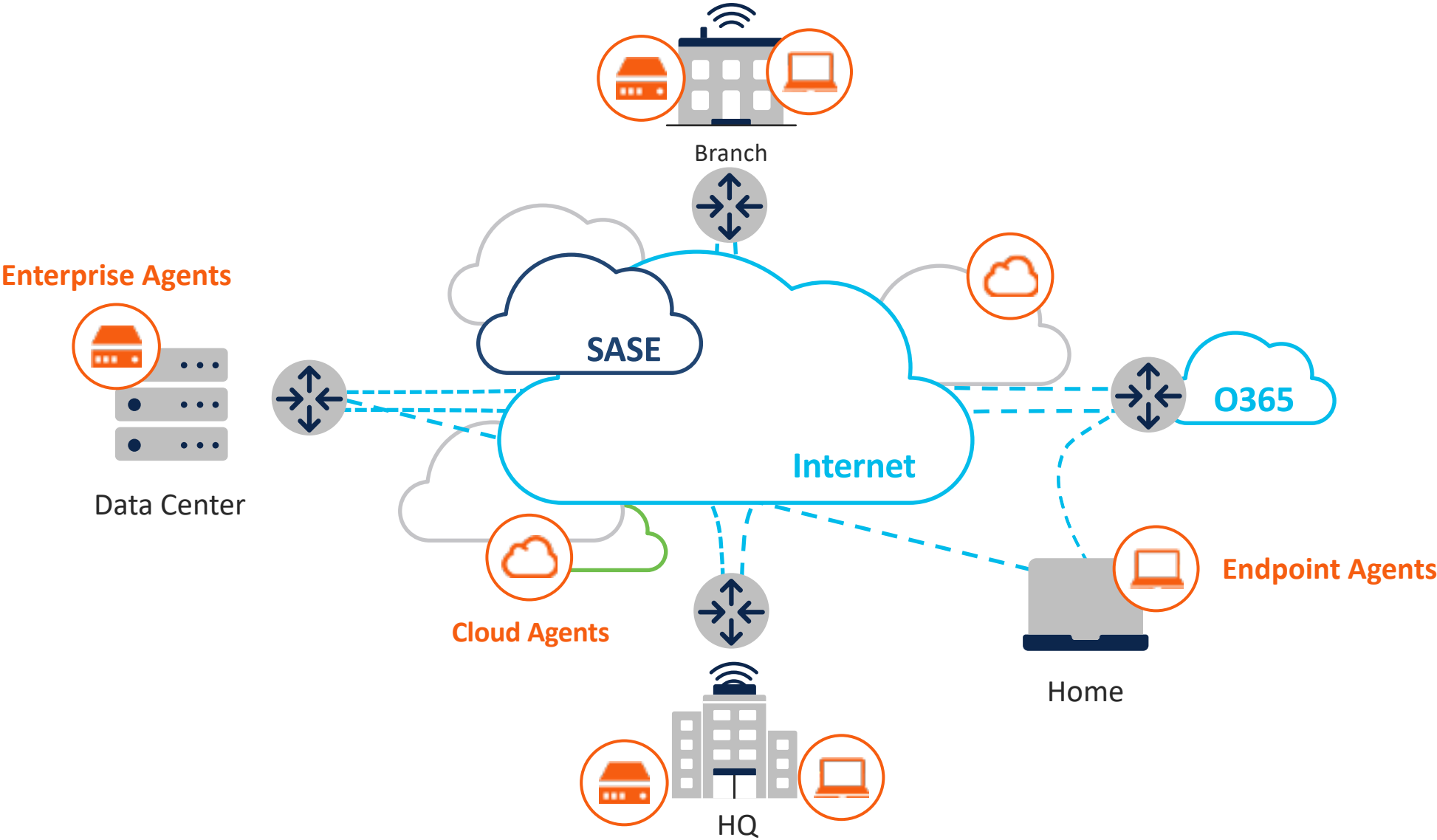
OT



- 1 Isolate IT and OT by installing an industrial DMZ with Cisco Secure FW
- 2 Install Cyber Vision Sensors and Center to gain visibility on OT
- 3 Cyber Vision Sensors embedded on IE3400 and Catalyst 9300 switches
- 4 Cyber Vision hardware-sensors deployed via one-hop SPAN to gain visibility on non-Cisco switches
- 5 Deploy Cisco Secure ISA3000 to isolate production zones
- 6 Cyber Vision shares details on OT devices and events with SOC to build informed security policies and investigate threats across domains

Více info Techclub: Novinky IoT portfolia v roce 2021

ThousandEyes



Most Correlated Visibility In One View

Time Correlated

Internet Insights

- Detection of global network outages
- Identification of affected domains



App Experience

- Transaction scripting, page load



HTTP/DNS/RTP Server

- HTTP Availability, response time, throughput



Network Metrics

- Packet Loss, Latency, Jitter



Path Visualization

- Hop-by-hop; multi-point; bidirectional
- Metrics and data per hop
- Integrated Outage Detection



BGP Monitoring

- Reachability, path changes, updates

