DTLab

SDN and Edge computing in Cisco solutions

DTLab

Agenda:

- Cisco DTLab
- Cisco SDN and Automation
  - IBN, DNA-Center
  - Field Network Director
- Edge computing
  - Cisco IOx

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Cisco Digital Transformation Lab

DTLab

- ✓ Cisco Networking Academy
- ✓ Research projects
- ✓ Co-innovation projects
- ✓ Workshop
- ✓ Graduate work
- ✓ …

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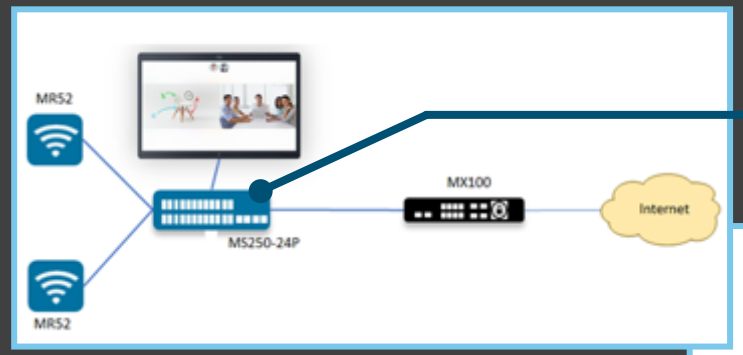
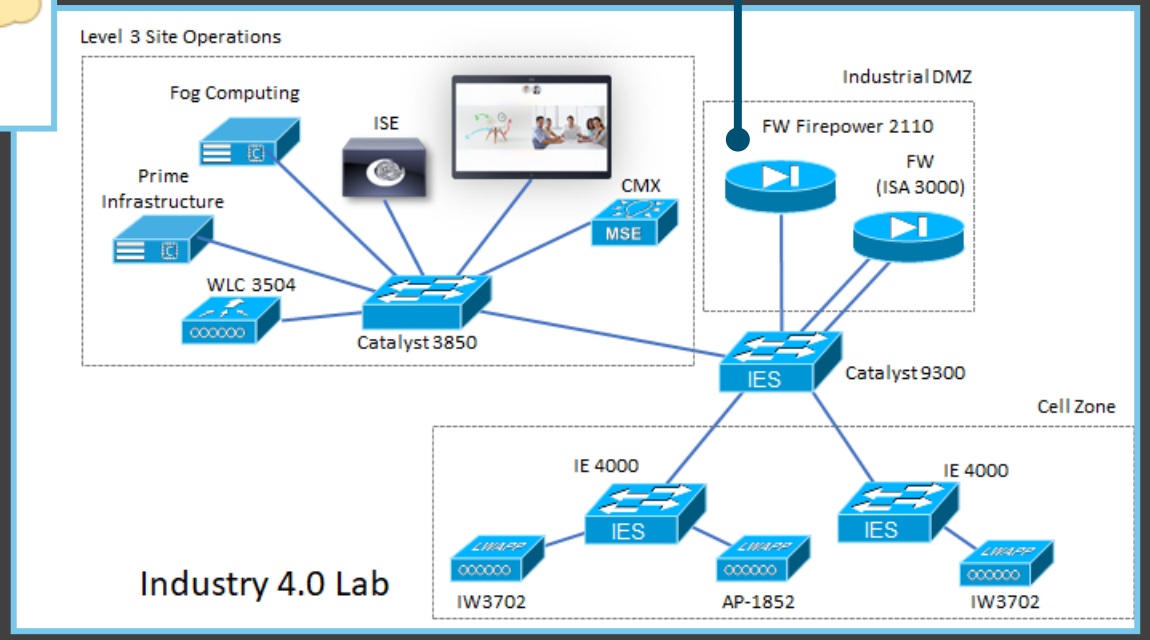
DTLab equipments





The 4th industrial revolution is the action of the physical world becoming a type of information system through sensors and actuators embedded in physical objects and linked through networks.

DTLab equipments

Cisco IoT System six pillars:

- Network Connectivity
- Fog/Edge Computing
- Security
- Data Analysis
- Management and Automation
- Application Enablement Platform.

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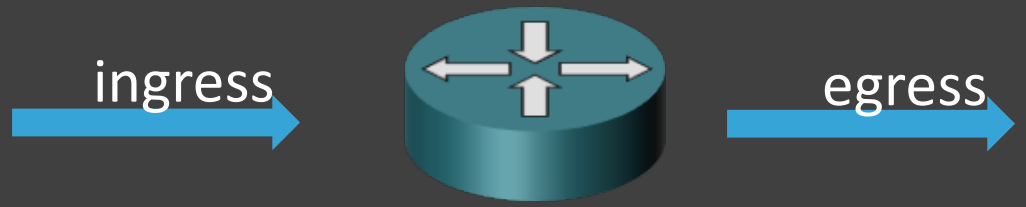
Digital Transformation

- The network plays a key role in the Digital Transformation:
  - All the enabling technologies need to communicate through the network
- New challenges for the network in planning, adoption, deployment and operations

SDN and Automation

Control Plane

Hardware	Purpose	Example Processes
Device CPU	makes decisions about where traffic is sent	routing protocols, spanning tree, AAA, SNMP, CLI



Data Plane

Hardware	Purpose	Example Processes
Dedicated ASICs	forwards traffic to the selected destination	packet switching, L2 switching, QoS, policies, ACLs

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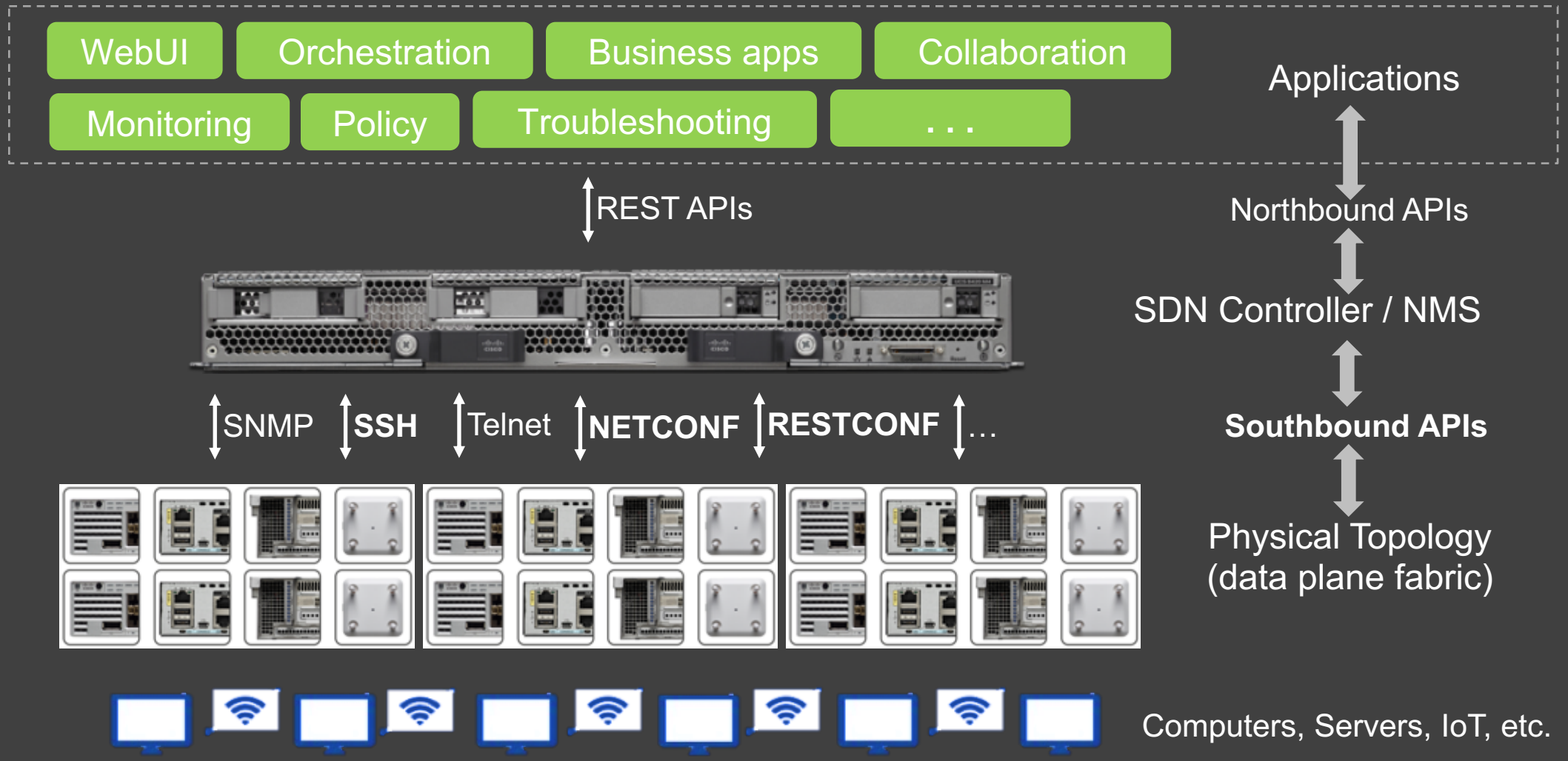
Cisco Data Control and Management plane



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Issues

- Too many network variations and combinations (snowflakes) make it challenging to adopt new capabilities and services.
- Traditional wireless networks are managed separately and are difficult to segment.
- VLANs are simple but, in this case, simple is not best — a at Layer 2 design exposes the organization to too many potential events that could take down the network, and in addition, managing hundreds of VLANs is daunting for most organizations.
- Despite having VRF capabilities for more than ten years, only a small percentage of organizations have deployed VRF segmentation in any form. Why is this? In a word — complexity.
- The traditional methods used today for policy administration (large and complex ACLs on devices and rewalls) are very dicult to implement and maintain.
- Most organizations want to establish user/device identity and use it end-to-end for policy. However, many nd this to be a daunting task.
- Most organizations lack comprehensive visibility into network operation and use — limiting their ability to proactively respond to changes.
- No wonder it takes days or weeks to roll out new network services today!

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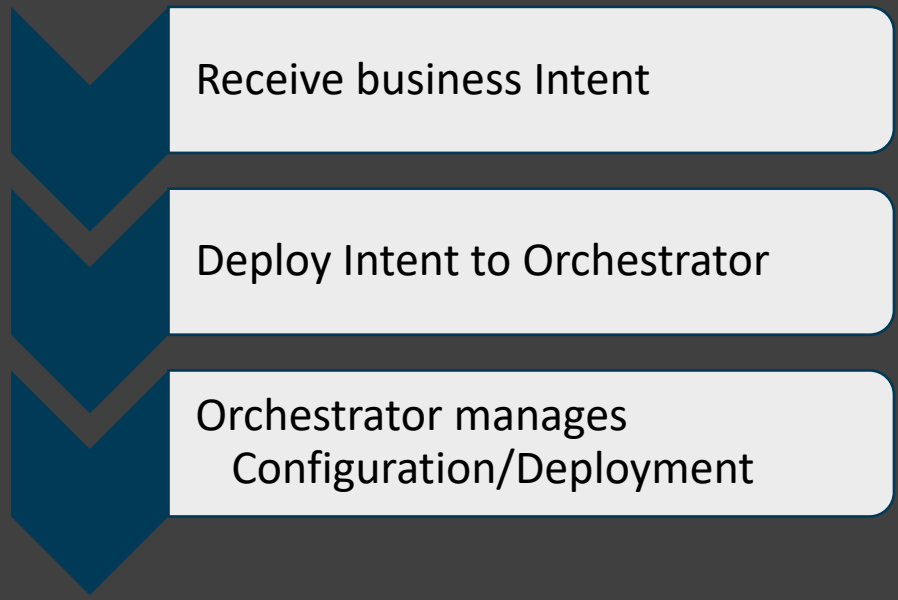
The Intent Based Networking concept

Intent:

"an abstract, high-level policy used to operate a network" [RFC7575]

- Adoptability to changes at scale
- Abilty to consume and process analytics that are context/intent aware
- Operations need to be streamlined and automated
- Short times



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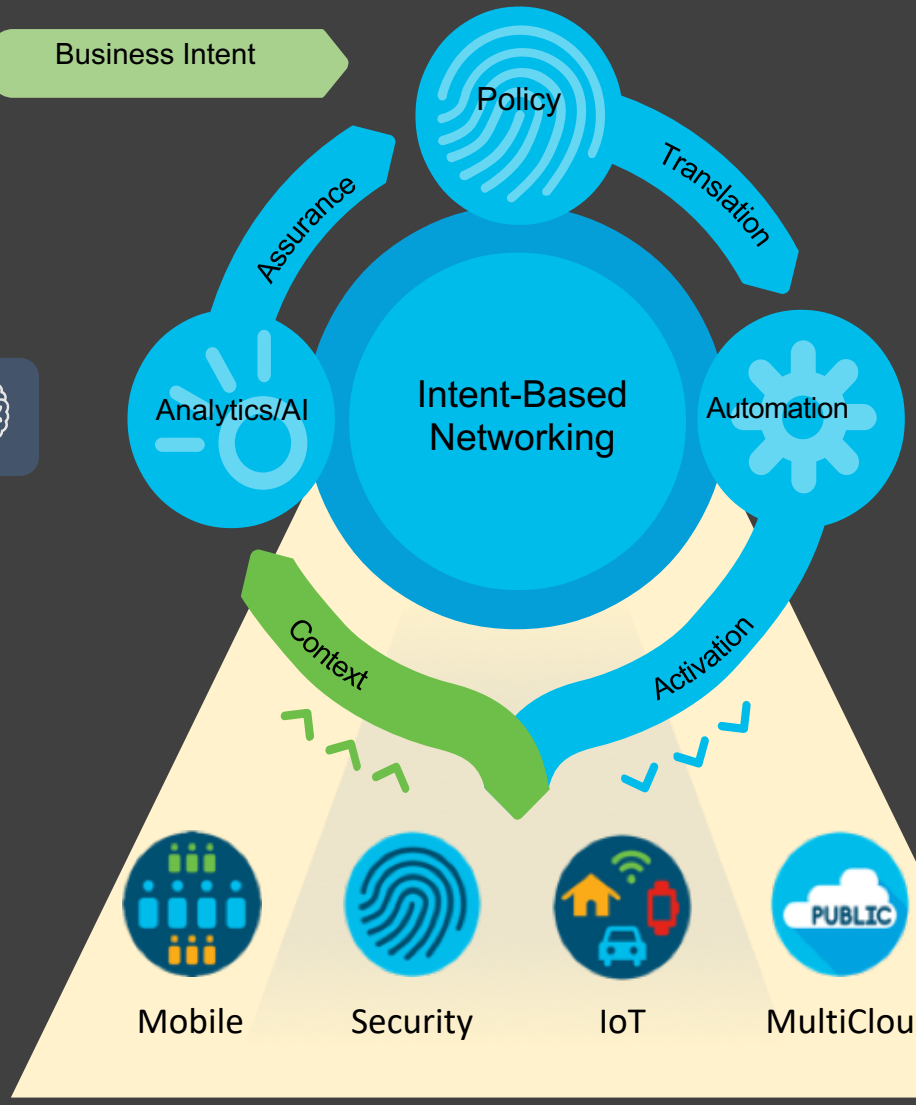
Cisco IBN



Enterprise wide visibility & assurance

Consistent security

Comprehensive automation

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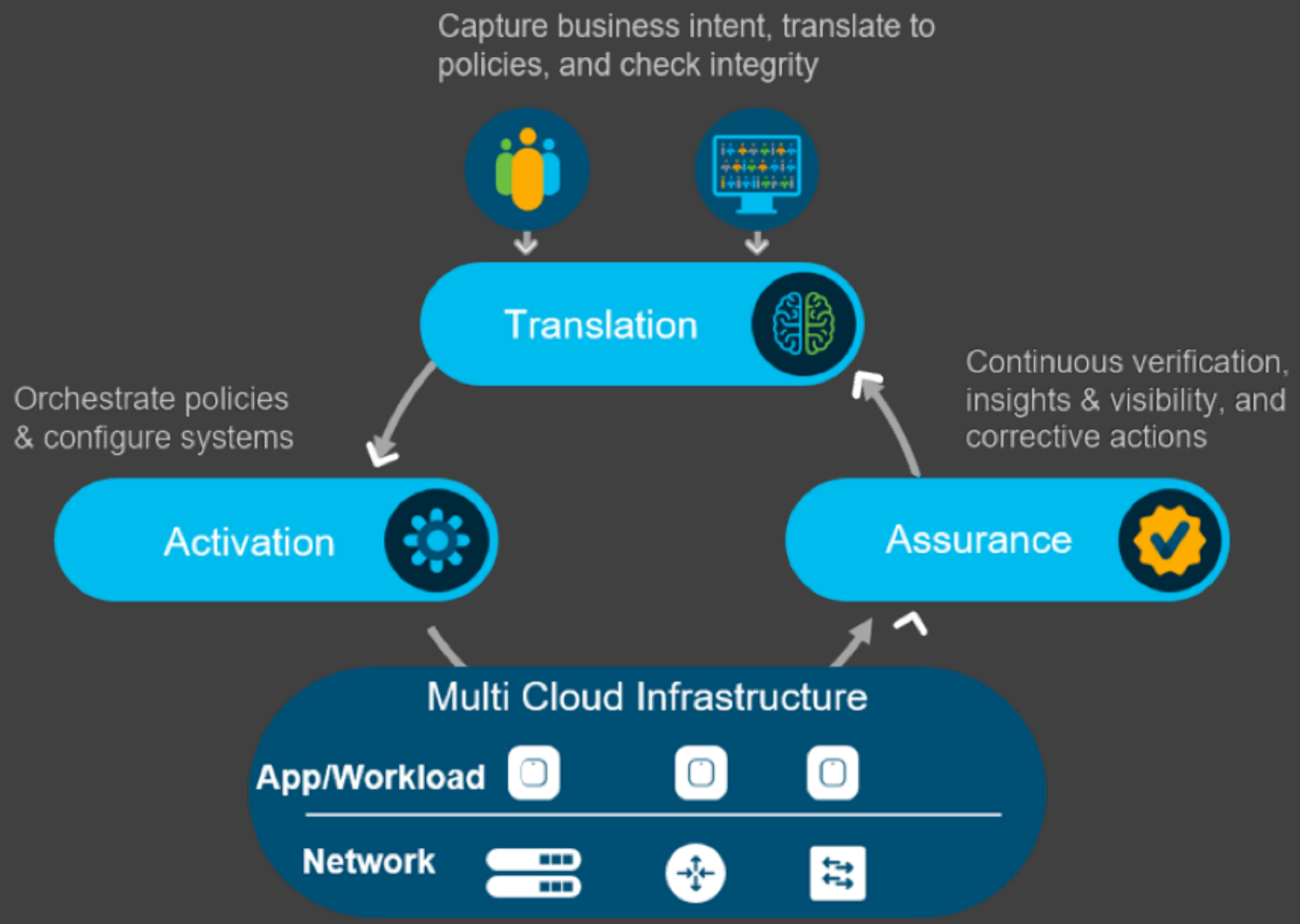
DNA-Center and IBN



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Provisioning: common vs. DNA-Center

Every device has to be:

- Pre-staged
- Configured loaded
- Maintained

```
Password:
7000# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
7000(config)# int e1/1
7000(config-if)# ip address 5.5.5.5 255.255.255.0
7000(config-if)# description LINK TO ROUTER123
7000(config-if)# speed 10000
7000(config-if)# duplex full
7000(config-if)# no shut
7000(config-if)# end
```

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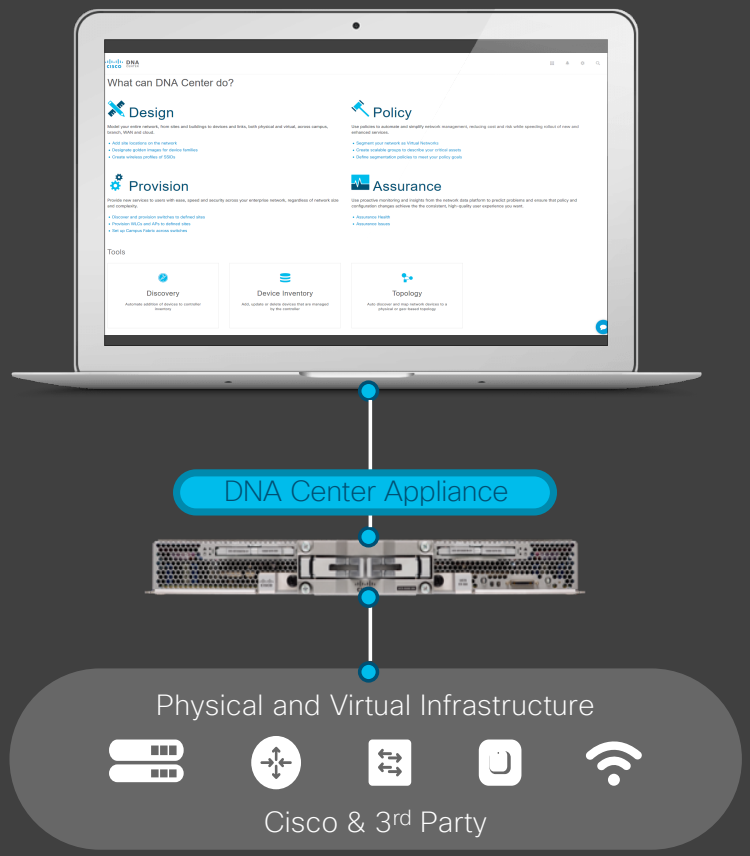
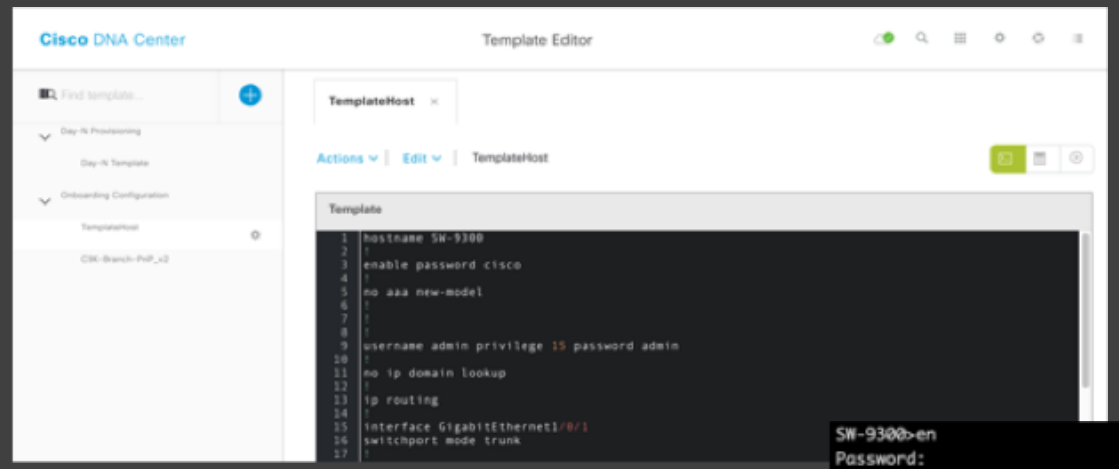
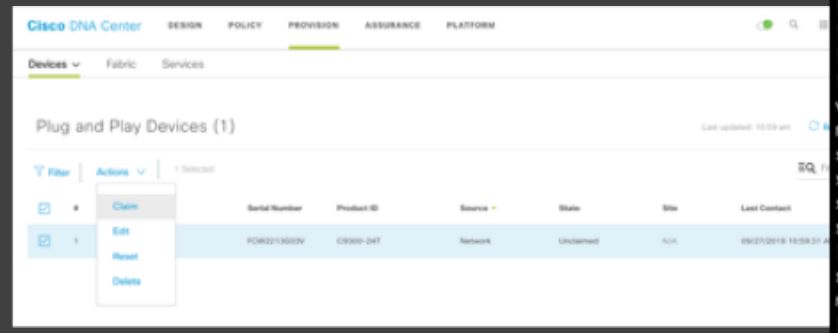
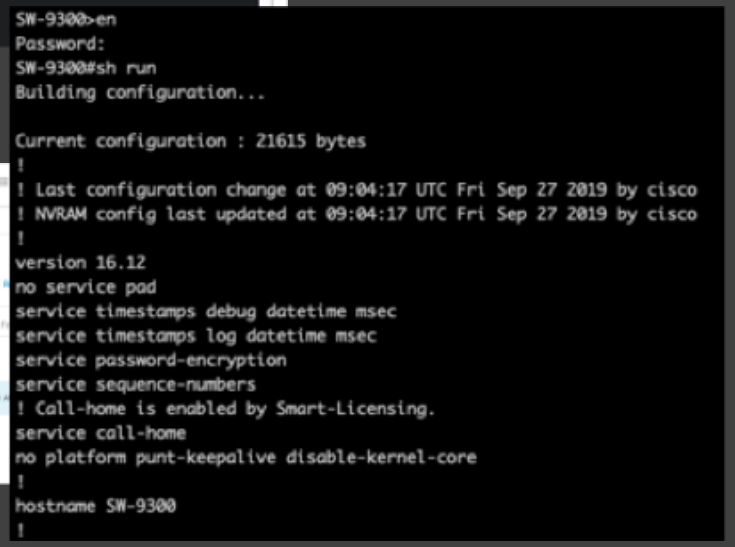
Provisioning: common vs. DNA-Center









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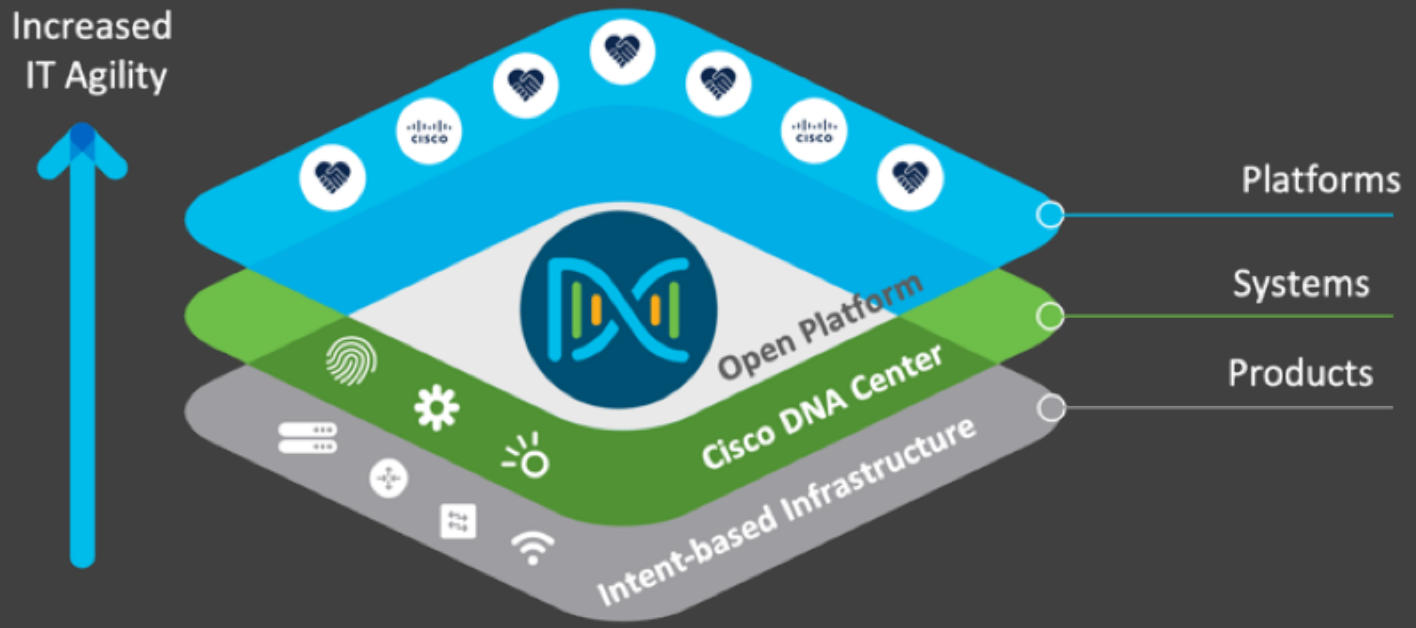
DNA-Center – Programmability and Integrations

- **Intent APIs**
  - Inventory, Topology
  - Site Design, Wireless,
  - SWIM, PnP, SDA,
  - Templates, Assurance,
  - Command Runner, Path Trace
- **Notifications via Webhooks**
  - Real-time Event Notifications for Assurance
  - Automation
  - System
- **Integrations**
- **Developer Enablement**
  - Cisco DevNet
  - Ansible Playbooks
  - Device Pack SDK
  - Python SDKs



developer.cisco.com/dnacenter

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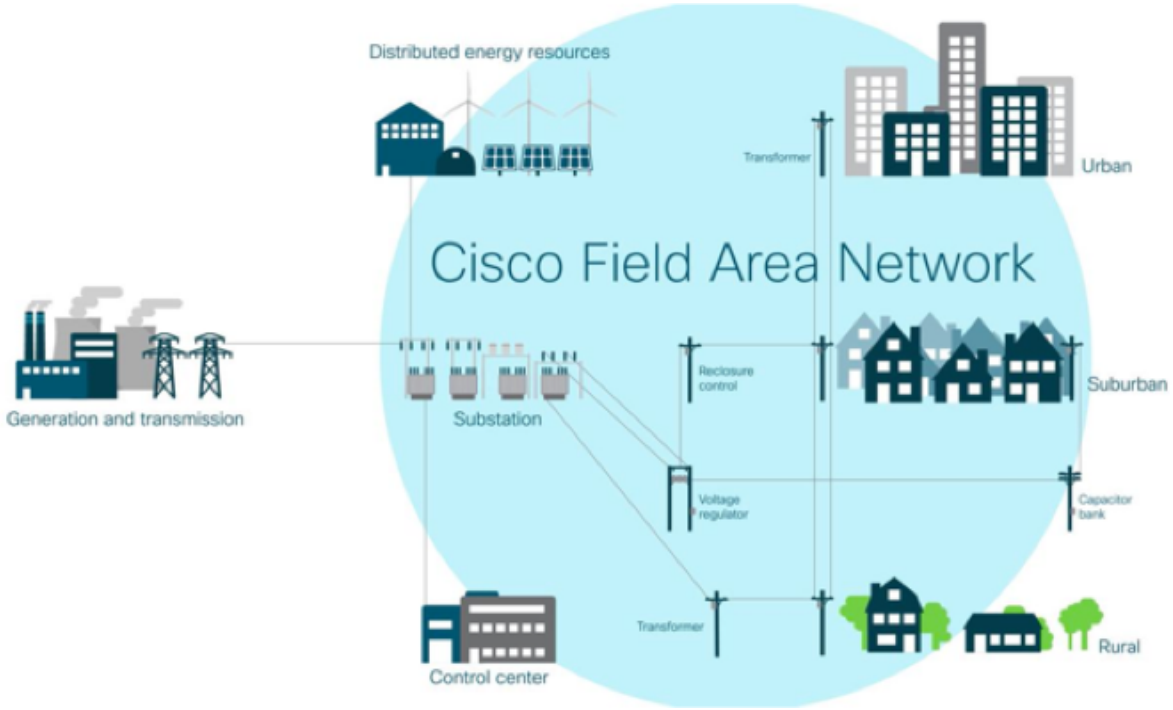
Field Network Director



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Field Network Director

Group Members | Edit Configuration Template | Push Configuration | Group Properties

Current Configuration revision #1 - Last Saved on 2020-03-04 11:51

```
<#if far.isRunningIos()>
 <#--
  If a Loopback0 interface is present on the device (normally configured
  during tunnel provisioning) then use that as the source interface for
  the HTTP client and SNMP traps. The source for the HTTP client is not
  changed during tunnel provisioning because usually the addresses assigned
  to the loopback interface are only accessible through the tunnels.
  Waiting insures the tunnel is configured correctly and comes up.
 -->
 <#if far.interfaces("Loopback0")?size != 0>
  ip http client source-interface Loopback0
  snmp-server trap-source Loopback0
 </#if>

 <#-- Enable periodic inventory notification every 1 hour to report metrics. -->
  cgna profile cg-nms-periodic
   interval 60
   exit
<#-- Enable periodic configuration (heartbeat) notification every 15 min. -->
  cgna heart-beat interval 15
<#-- Enable the following configurations for the nms host to receive informs instead of traps -->
<#-- no snmp-server host ${nms.host} traps version 3 priv ${far.adminUsername} -->
<#-- snmp-server engineID remote ${nms.host} ${nms.localEngineID} -->
<#-- snmp-server user ${far.adminUsername}  cgnms remote ${nms.host} v3 auth sha ${fa
<#-- snmp-server host ${nms.host} informs version 3 priv ${far.adminUsername} -->
<#--
    Enable the following configurations to generate events that track if the router
    moves by a certain distance (unit configurable) or within a certain time (in minutes)
 -->
<#-- cgna geo-fence interval 10 -->
```

Map | Inventory

Ping | Traceroute | Add Devices | Label | Bulk Operation | More Actions | Export CSV | Loca

Name	Meter ID	Stat...	Last Heard	Categ
IR809G-LTE-GA-K9+JMX2022X04S		?	never	ROUT

```
CGR-Alleantia#sh run
Building configuration...


Current configuration : 7930 bytes
!
! Last configuration change at 16:51:32 UTC Fri May 15 2020
! NVRAM config last updated at 16:37:57 UTC Fri May 15 2020
!
version 15.8
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname CGR-Alleantia
!
boot-start-marker
boot-end-marker
!
!
enable secret 5 $1$iDxO$xgMylQpOovNytmrCBdooj/
enable password cisco
!
no aaa new-model
!
!
```

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Edge computing vs. Cloud computing

Cloud computing

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

The NIST Definition of Cloud Computing

Edge computing

Edge computing is part of a distributed computing topology where information processing is located close to the edge, where things and people produce or consume that information.

Edge Computing- Gartner glossary

Edge computing vs. Cloud computing: is not an either-or debate, nor are they direct competitors.

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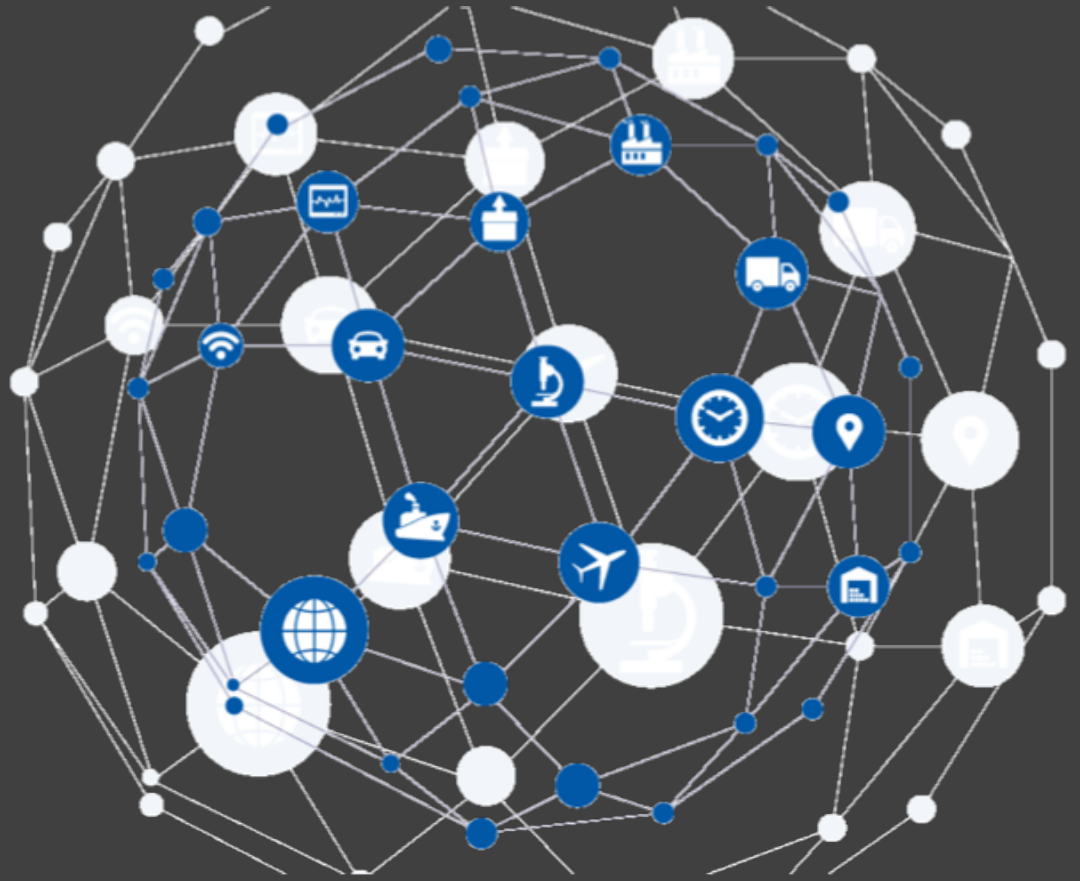
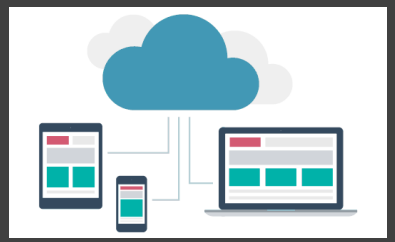
IoT and Cloud computing

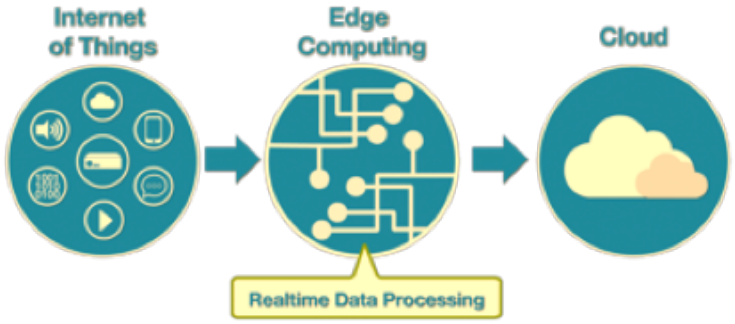
- **Delay**
- **Bandwidth**

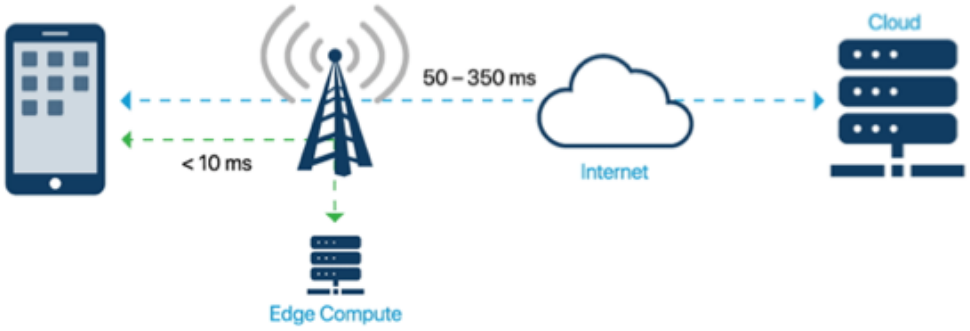




IoT and Edge computing

- **Improved Performance**
- **Reducing Operational Costs**





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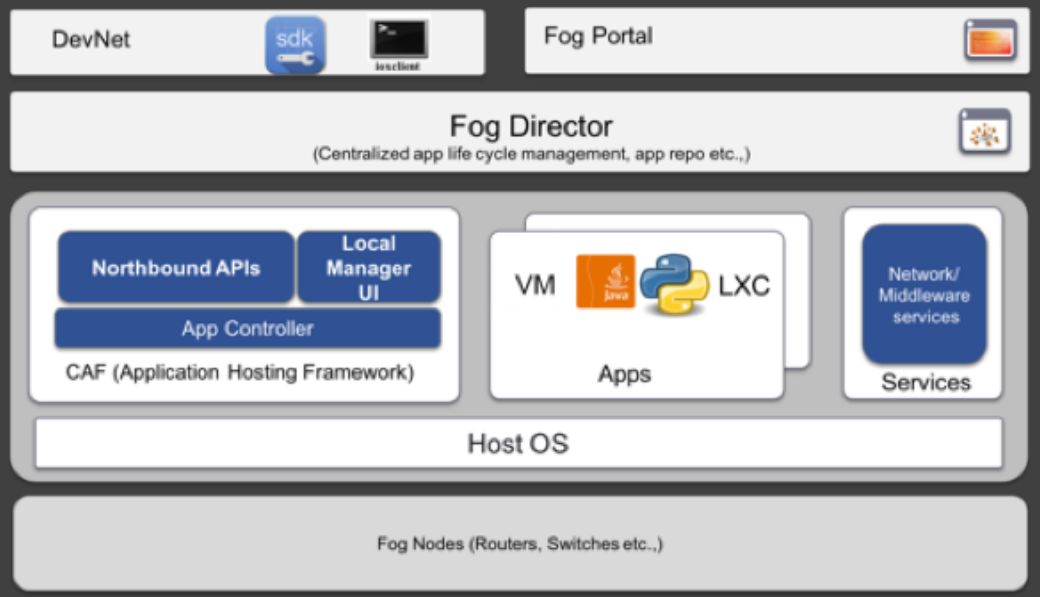
Edge computing and Cisco

Cisco IOx is an application environment that is used by businesses ranging from manufacturing and energy corporations to public sector organizations such as cities and transportation authorities that use IoT technologies to produce effective business outcomes.

Cisco IOx allows you to execute IoT applications in the fog with secure connectivity with Cisco IOS software, and get powerful services for rapid, reliable integration with IoT sensors and the cloud.



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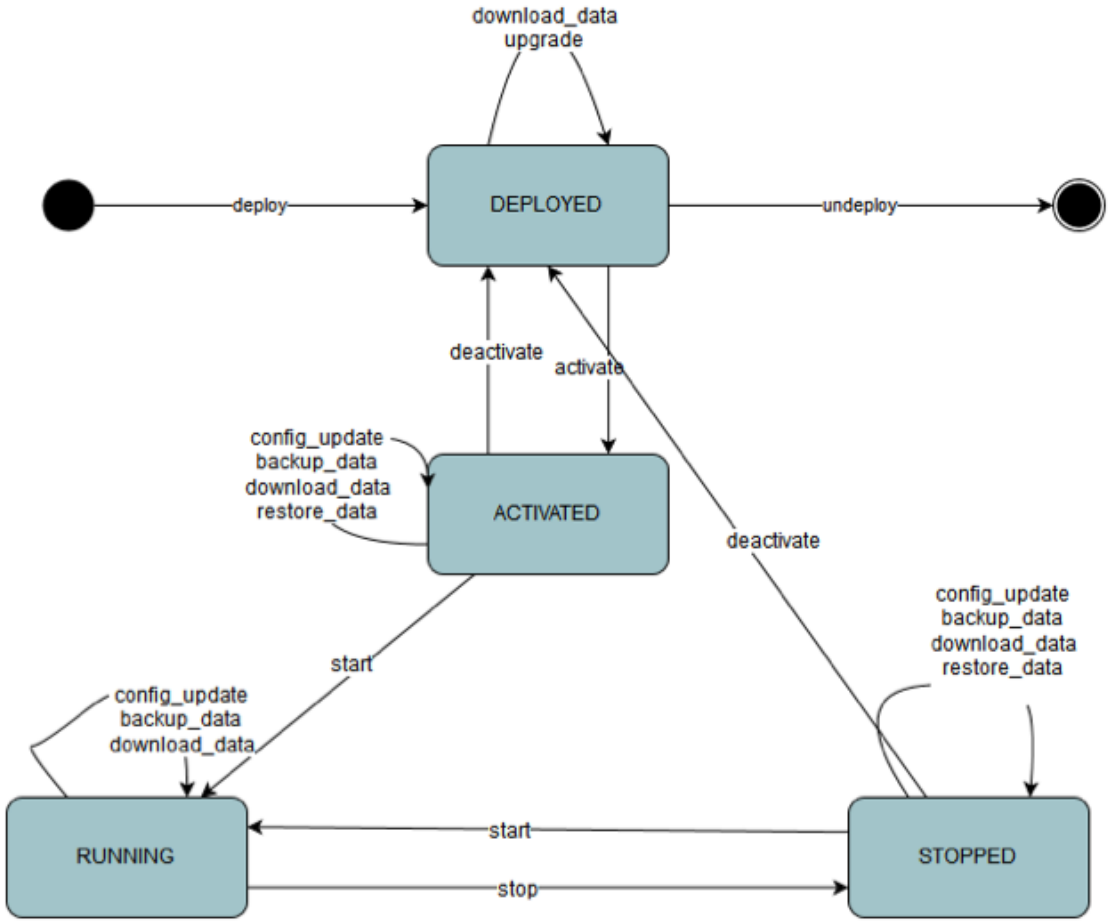
Application Hosting

An application residing on the Fog node, will be in any of the following states:

- DEPLOYED: Application is installed on the device. Resources needed by the application is not committed to the application.
- ACTIVATED: The resources required by the application is now committed. Associated container artifacts are also generated.
- RUNNING: Application is now running
- STOPPED : Application is stopped.



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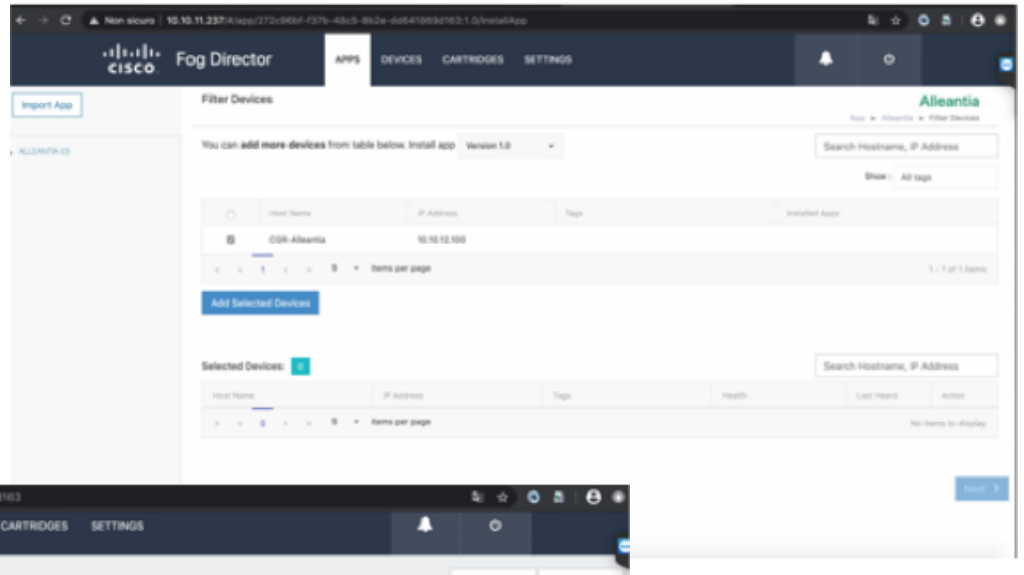
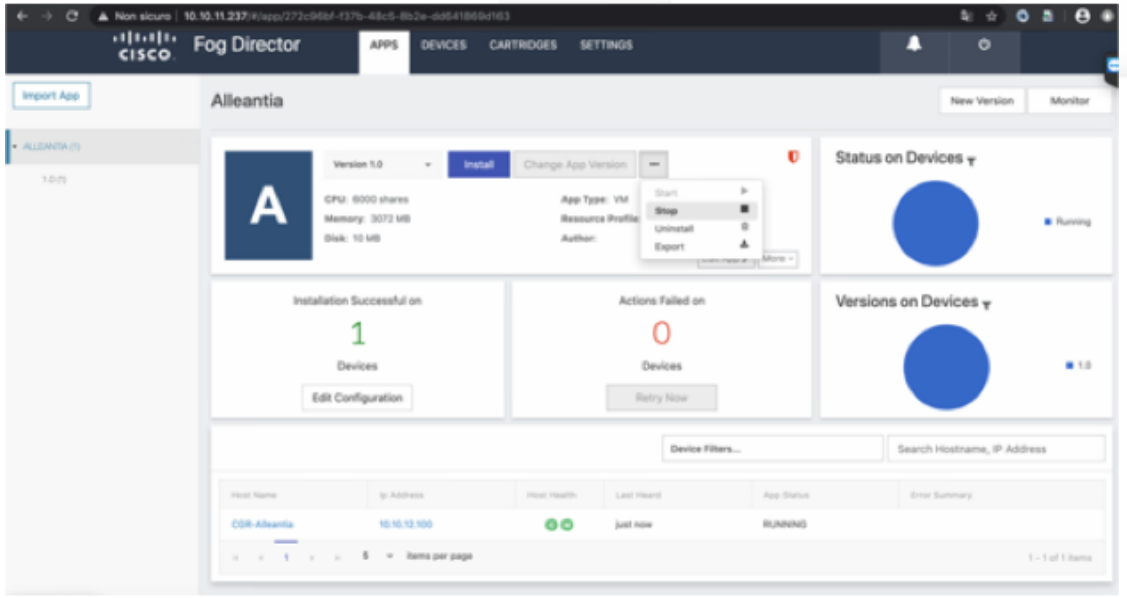
Application Hosting





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- **DTLab:** https://www.dtlabnetworkingbootcamp.it/
- **DNA-C**
  - **developer.cisco.com/dnacenter**
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  - https://developer.cisco.com/site/sandbox/
  - https://developer.cisco.com/docs/dna-center/api/1-3-3-x/
  - https://developer.cisco.com/docs/dna-center/#!hello-world/hello-world
  - https://blog.postman.com/introducing-cisco-devnet-apis-to-the-postman-api-network-security-networking-device-and-video-conferencing-apis/
- **FND**
  - https://www.cisco.com/c/en/us/td/docs/routers/connectedgrid/iot_fnd/api_guide/3_0/IoT-FND_NB_API.html
- IOx
  - https://developer.cisco.com/docs/iox/#!introduction-to-iox

Thank you!