# Nuviso Concerto (NCO)

## SDWAN solution based on Nuviso Symphony Suite

# What Does Nuviso Networks Do?

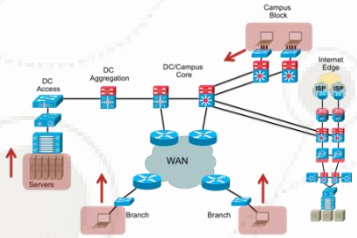
## Enables Network Agility for Enterprise and Telco Operations

### *Simplicity Agility*

*Define*

*Deploy*

*Scale*

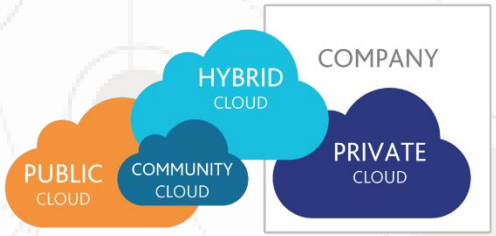



### *E2E Network*

*Core/Transport*

*Branch/Edge*

*Cloud/DC*




### *Heterogeneous Environments*

*Physical*

*Virtual*

### *Varied Deployments*

*Brownfield*

*Greenfield*

# The Problem – Enterprise and Telco Networks are Complex; Available Solutions are Fragmented

## Current Enterprise and Telco Pain Points

***IDC:***

- *42% time spent on maintaining legacy systems*
- *5% time spent on business critical projects*

***Complex Networks***

| Past | Present |
|---|---|
| • Physical End Points | • Physical & Virtual End Points |
| • Not Controller Based | • Legacy & Controller Based |
| • Adequate for legacy application needs | • Need to adapt rapidly to workloads |
| • Command Line based Management | • Programmability & Service abstractions / API-based management |


***Fragmented Solutions***

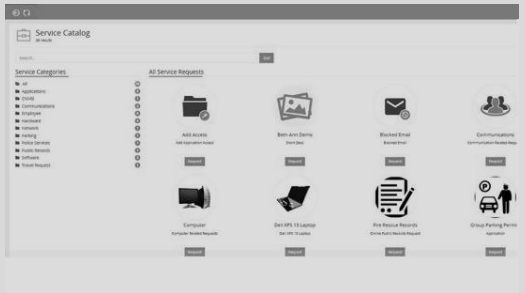
- **Telco/SP Pain Points**
  - **Rapid enablement of new services and technologies (MEC, 5G, RAN Management among others)**
  - **Lack of brown-field automation for easier infrastructure service deployment**
  - Need for Multi-vendor mediation for service and configuration
  - Problem of Orchestration support for multi-domains
  - No support for NFV Multi-cloud
  - No easy way of migration for managed services
- **Enterprise Pain Points**
  - **No intent Driven Configuration**
  - **No coherent IT Operations story (both Net and Sec Ops)**
  - **Complex branch Connectivity**
  - Silos of network Management
  - No easier Cloud migration

# The Nuviso Solution – A Few Steps to Automate Operations Across Any Infrastructure

## DRAG/DROP NETWORK SERVICES OR APPLICATIONS FROM CATALOG

***STEP***

**1**

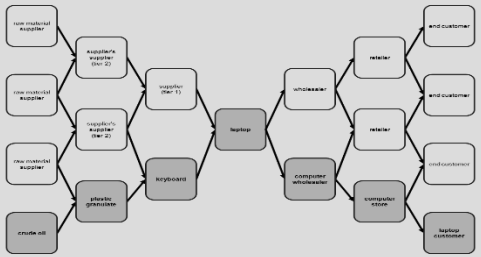



- *Applications*
- *Network Services*

## CONNECT APPS AND NETWORK SERVICES

***STEP***

**2**

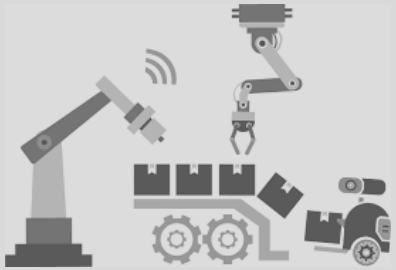


- *Stitching/Chaining*
- *Scale-out/Scale-in*
- *Analytics and Automation*

## CLICK TO AUTO DEPLOY E2E NETWORK OR APPLICATION SERVICES

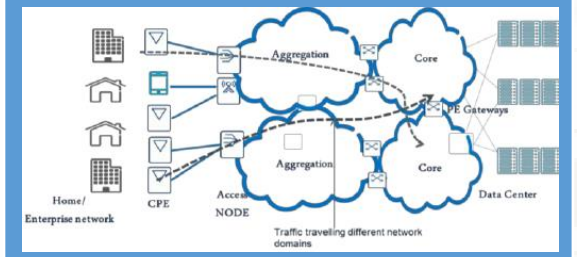
***STEP***

**3**



- *Deploy in any Domain*
- *Service Monitoring*
- *Auto Rollback*

## SERVICE DEPLOYED




- *Private/Public/Hybrid Clouds and Campus*
- *Scale and Adapt*
- *Performance Assurance*
- *Service Continuity*

# Nuviso Products/Technology - Symphony SW Suite
# API Driven and Integration Ready

Symphony Suite

BGP/MPLS Service Orchestrator

Customer Specific Applications

TMF Resource Orchestration API

Network Mgmt Monitoring & Analytics

NCO(Concerto) SDWAN Controller

VNF Service Composer

Apps

Framework

NMO(Maestro) (Cross Domain Orchestrator)

NIA(Interlude) (Element & Service Config)

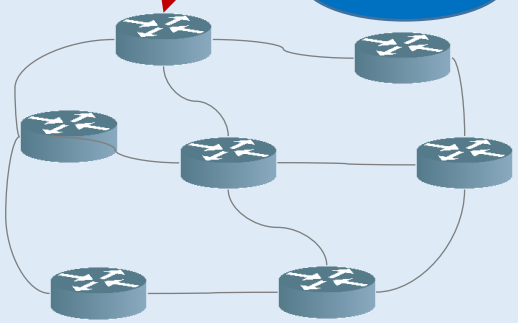
NVO(Vivace) ( NFV MANO - ETSI)

NCA (Collection & Config Mgmt)

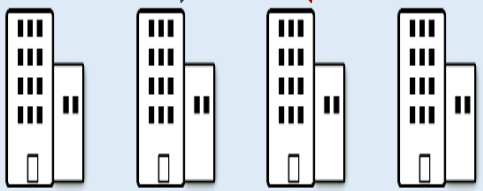
Consonance

App Market Place

EMS



IP / MPLS / Optical Networks (SP Core)



White-box based branch routing / Distributed NFV (Branch edge automation / SDWAN)

Virtual Infra Managers (OpenStack / Azure / Vmware)

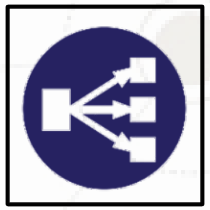
Cloud & Virtual Networks (Public Cloud & Data Center)

End-to-end Services

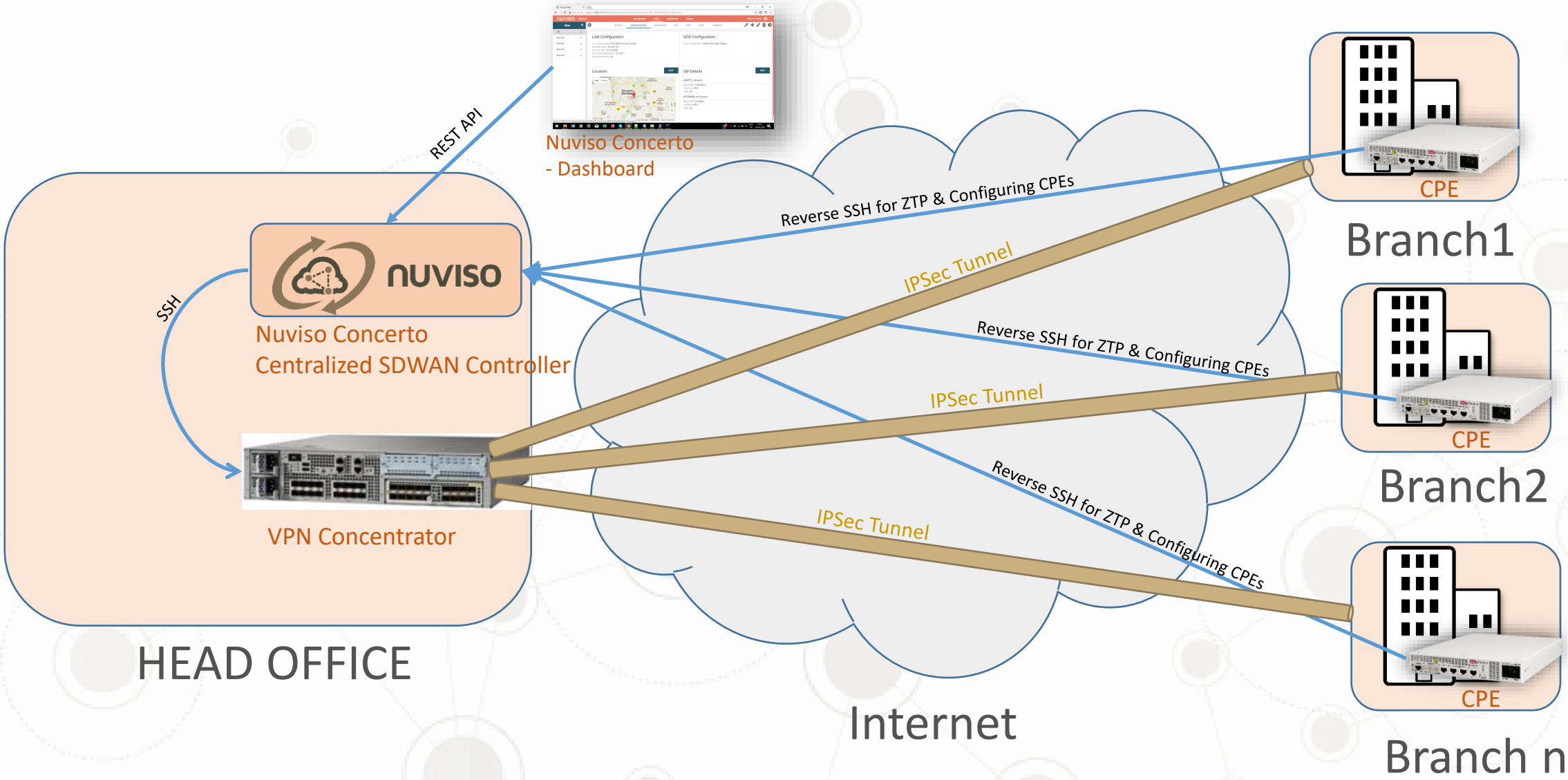
# Problem Statement

- Many enterprises that have multi-geography presence have often grown in an unplanned fashion, with each branch-office following their own IT model, ISP and policies
- In addition most of these branches have multiple service providers servicing each location, and private WAN meshes being used as well pushing up the cost.
- Each branch location follow their own policy and configuration to manage their campus network, as well as chose their Service Provider, resulting in a fragmented campus network across various establishments
- Concerto SDWAN is a solution that can be offered by Service Providers to public and private entities, that will better enforce policies in a uniform manner across all branches, as well as bring down overall IT costs
- Key difference from regular SDWAN solutions
  - Easy to use & deploy at very low TCO.
  - Nuviso Concerto framework can work with any vendor branch router (including existing CPEs)
  - Doesn’t enforce a proprietary hardware & software combination
  - Offers tremendous flexibility to the service provider to use their existing installed branch gear
  - Supports centralized and distributed NFV functions along with SDWAN, thereby avoiding the need to integrate multiple systems and solutions from different vendors

# Concerto Key Solution Highlights

| | | | |
|---|---|---|---|
|  | Centralized Control | Cloud and on prem support | Layered architecture |
| Zero touch provisioning |  | Automated branch provisioning and connectivity | Flexible branch functionality (physical or virtual form) |
| SDXAN | Future Proof | Service push using IETF/OpenConfig YANG models | NFV Management (fully complaint to ETSI MANO) |
| Flexible hardware support |  | No vendor lock in (uCPE/white box branch device) | Well defined REST API (for northbound support) |
|  | Multi-Tenant Support | Single installation for supporting multiple customers | Self service portal support for customers |

# Nuviso Concerto Communications Architecture



# Nuviso Concerto Architecture Components

| Component | Functionality | Example Hardware |
|---|---|---|
| CPE | Provide Connectivity to headoffice over IPSec tunnel. May have multiple WAN links for redundancy | RAD ETX-2v with Intel Atom C2358<br>Protectli(FW4A) with Intel Atom E3845<br>(Any white box uCPE with: x86/ARM, 1GB RAM, 16GB storage would work) |
| VPN Concentrator | Head end termination point for ipsec tunnels coming from CPEs. | Cisco ASR 1K |
| Nuviso Concerto Controller | Centralized controller for managing all the CPE and Head office boxes. | Linux VM with 16GB RAM, 512GB Storage |
| Nuviso Concerto Dashboard | User interface for Nuviso Concerto Controller | Web based UI (Chrome/Safari/Firefox/IE Edge) |

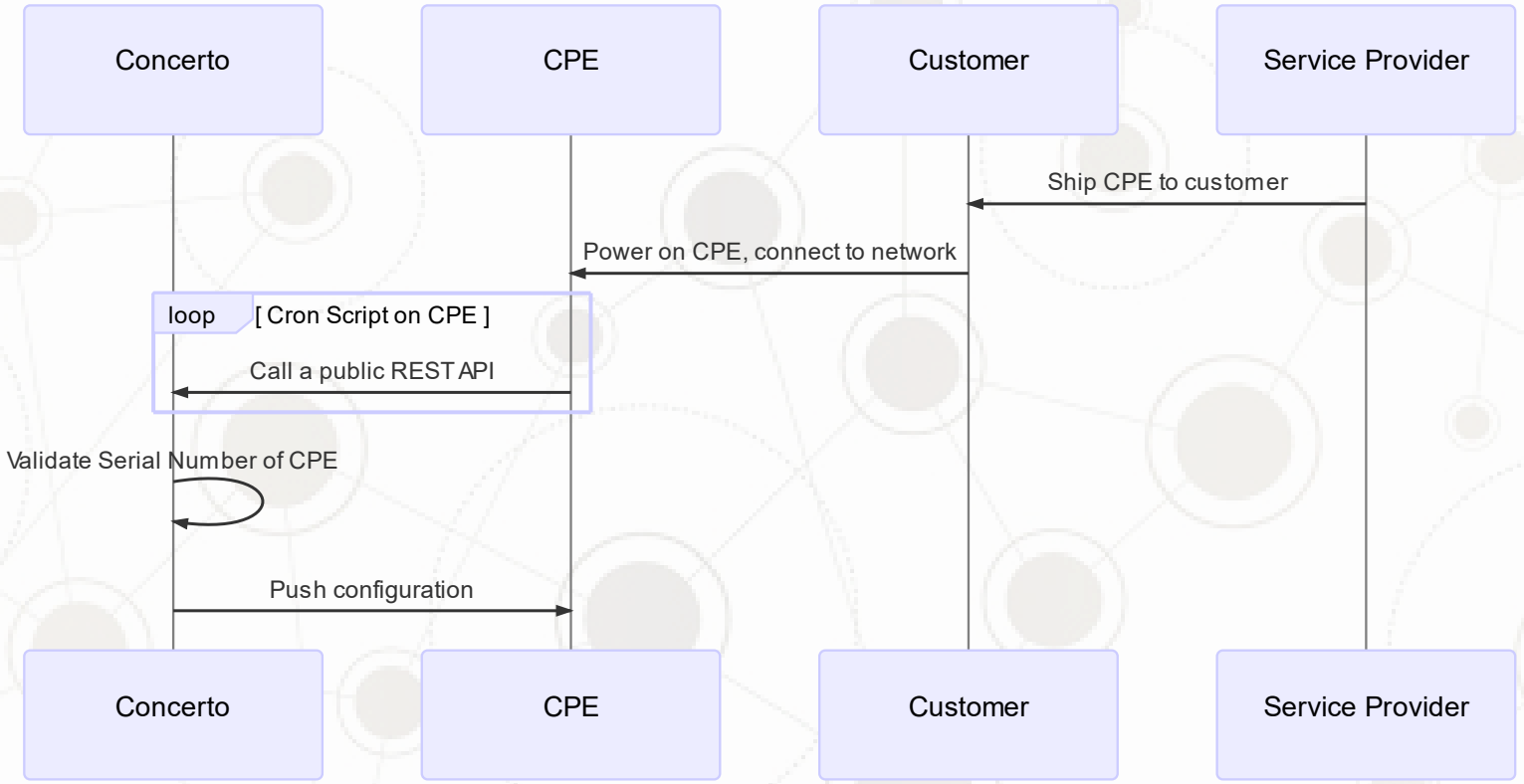
# Detailed Technical Features

| Technology Area | Features |
|---|---|
| SDN/NFV | ETSI compliant framework, YANG modeling, TOSCA templates, Zero Touch Provisioning, Northbound REST API, VNF Management, Service Chaining |
| Branch Router hardware | Whitebox architecture, x86 processor, Gigabit Ethernet, Wifi, LTE interfaces, Solid State Storage, Fan-less design (Or bring your own CPE e.g. NXP) |
| Branch Routing – core software | NAT, QoS, ACL, Security, VPN tunneling, Load Balancing, Overlay routing, Flow monitoring using SFLOW/NetFlow, Scripting based on event triggers |
| Branch Routing - Management | Device config using templates, Network Element Inventory, Topology, Policy Management, Certificate Management, AAA/Radius based authentication, SNMP, NTP, DHCP (client&server), Syslog, SSH, Zero Touch Provisioning |
| Controller | Centralized, Cloud Hosted / On-prem, North bound APIs based on YANG models, Dynamic extension of new models/devices/services, TM Forum API (roadmap) for OSS integration |
| Monitoring/Analytics/ Telemetry | Various statistics aggregated as a time-series database and summarized at different levels |
| Future expansion | Ability to bring in any new function as VNF and service chain with branch router VNF |

# Hardware choices

- Nuviso Concerto framework is multi-vendor capable by using abstract yang models from IETF/OpenConfg
- Easy to adapt to any hardware vendor
  - Standard solution offering is based on a universal CPE device (x86 or ARM based white-box) that boots Linux and capable of running any open-source routing function for branch-routing needs
  - For specific use cases, Nuviso has enabled usage of pre-existing branch routers, both in hardware and software form factors, to reduce solution capex. Can support vendors like Palo-Alto, Cisco etc, that have regular branch routing and VPN functions

# Nuviso Conerto ZTP – Sequence



# Nuviso Concerto ZTP- Highlights

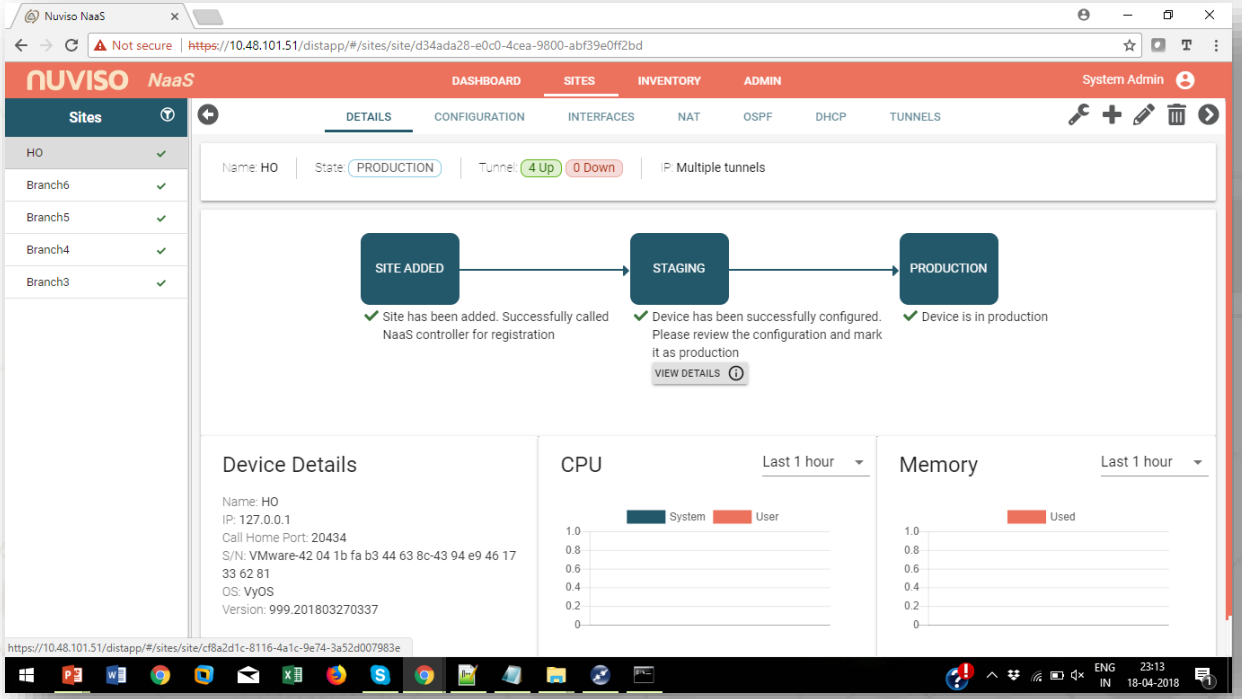
Summary:

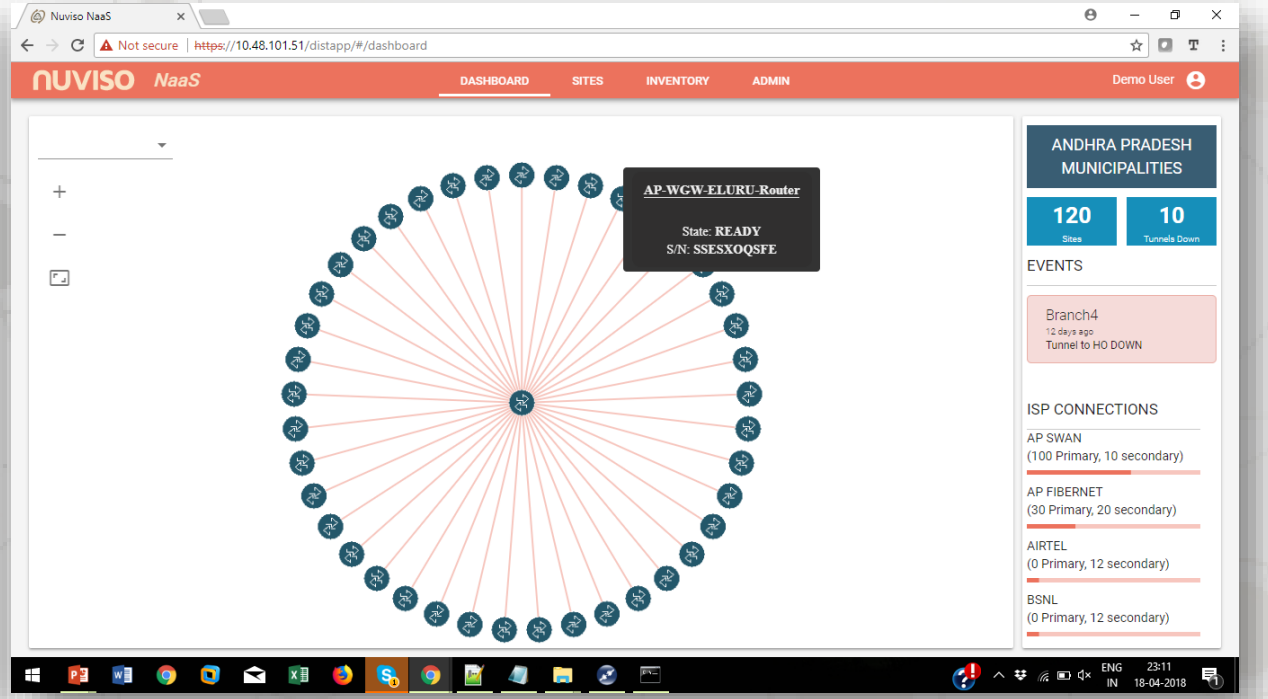
- Small cron script running on the CPE in the background.
- Calls publicly published REST API provided by Concerto
- Concerto validates serial number, creates the required configuration
- Concerto pushes the configuration to CPE over SSL connection

Advantages:

- CPE can be behind a firewall and/or NAT.
- CPE does not require to have a static public IP.
- Secure communication between Concerto and CPE over SSL with certificate
- User workflow to validate the configuration before moving the CPE to production stage.

# SDWAN controller screenshots



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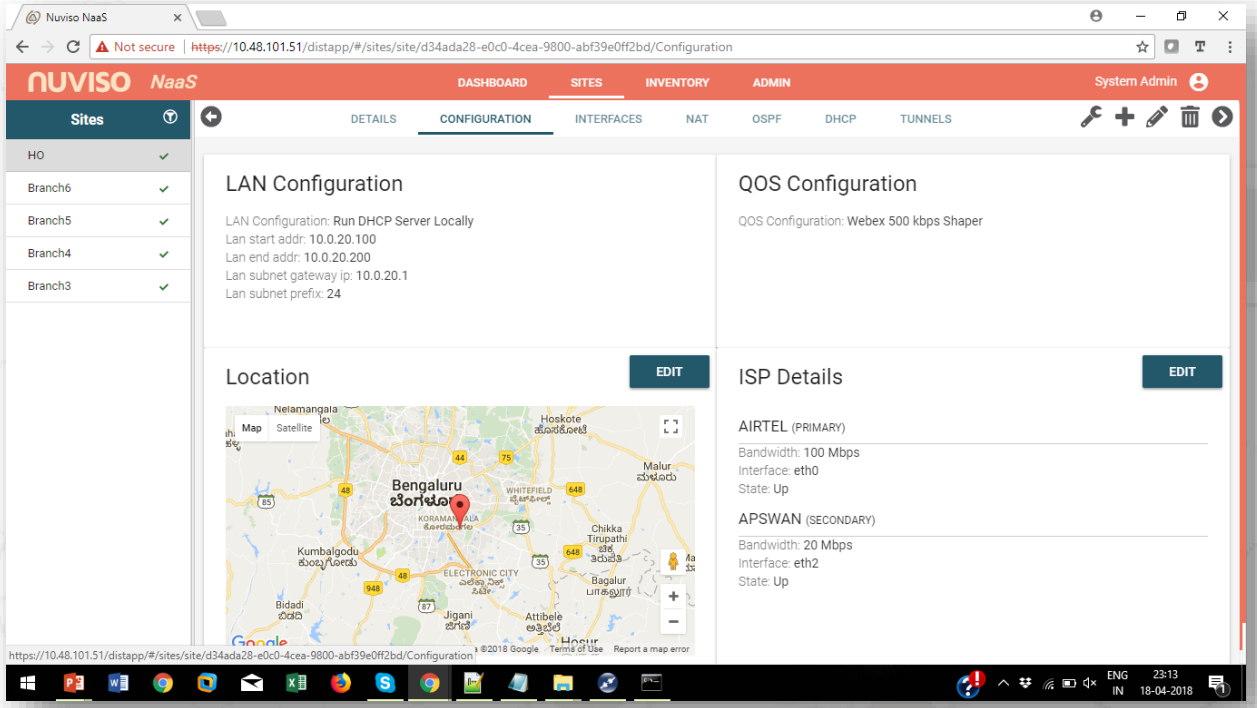


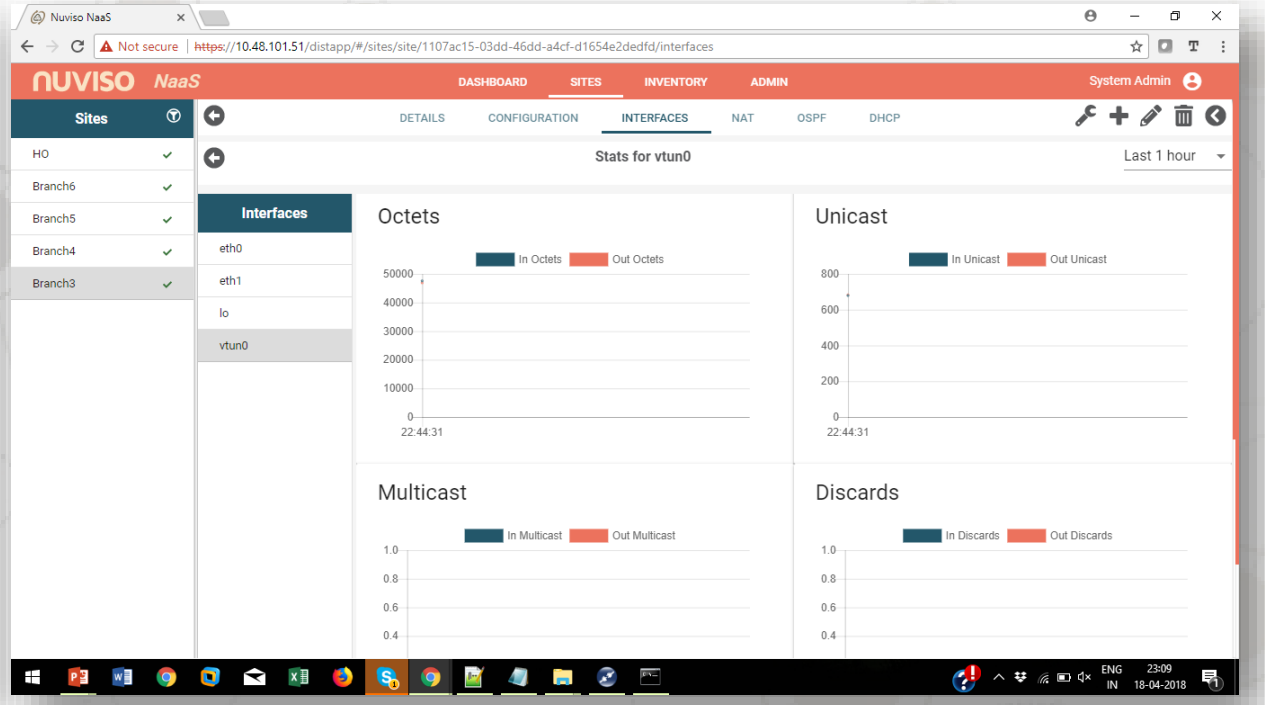

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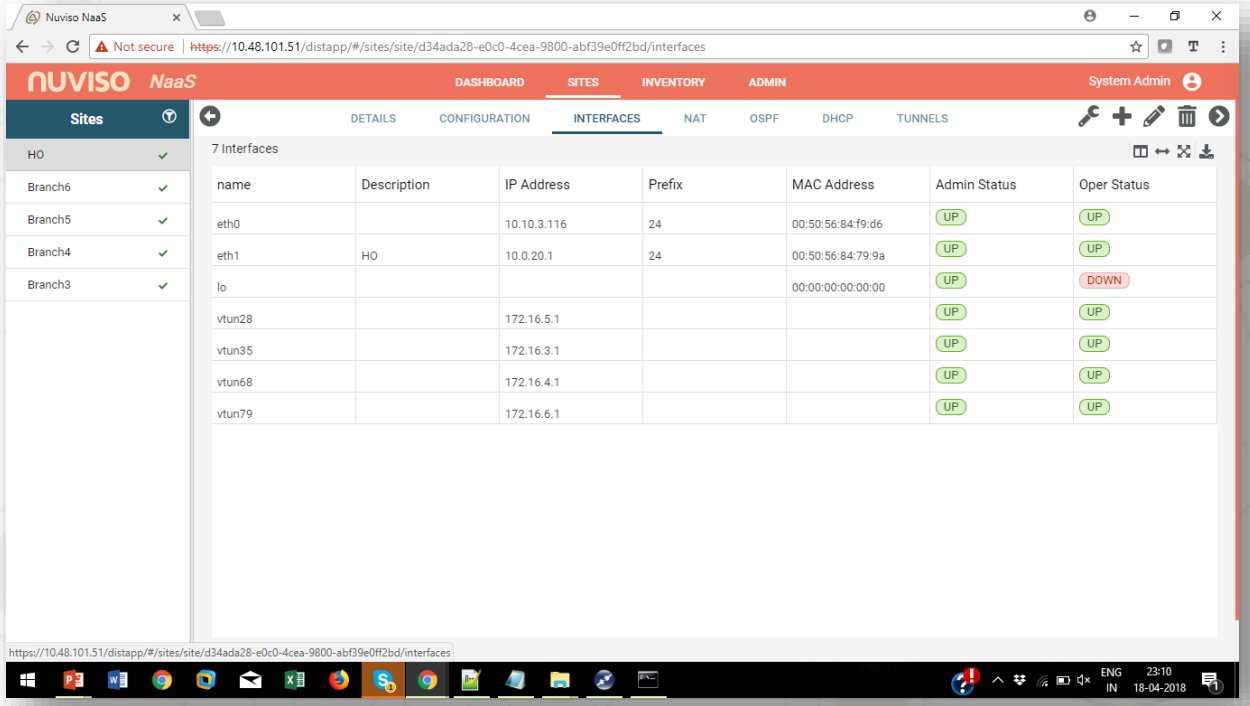
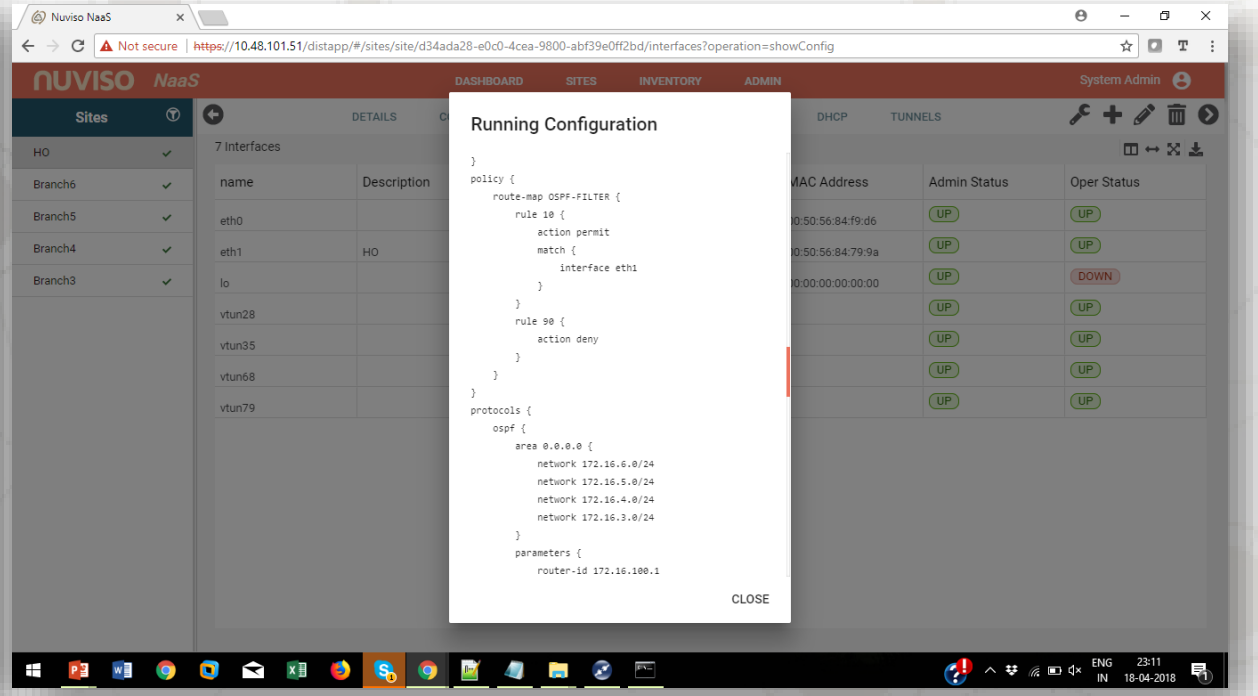
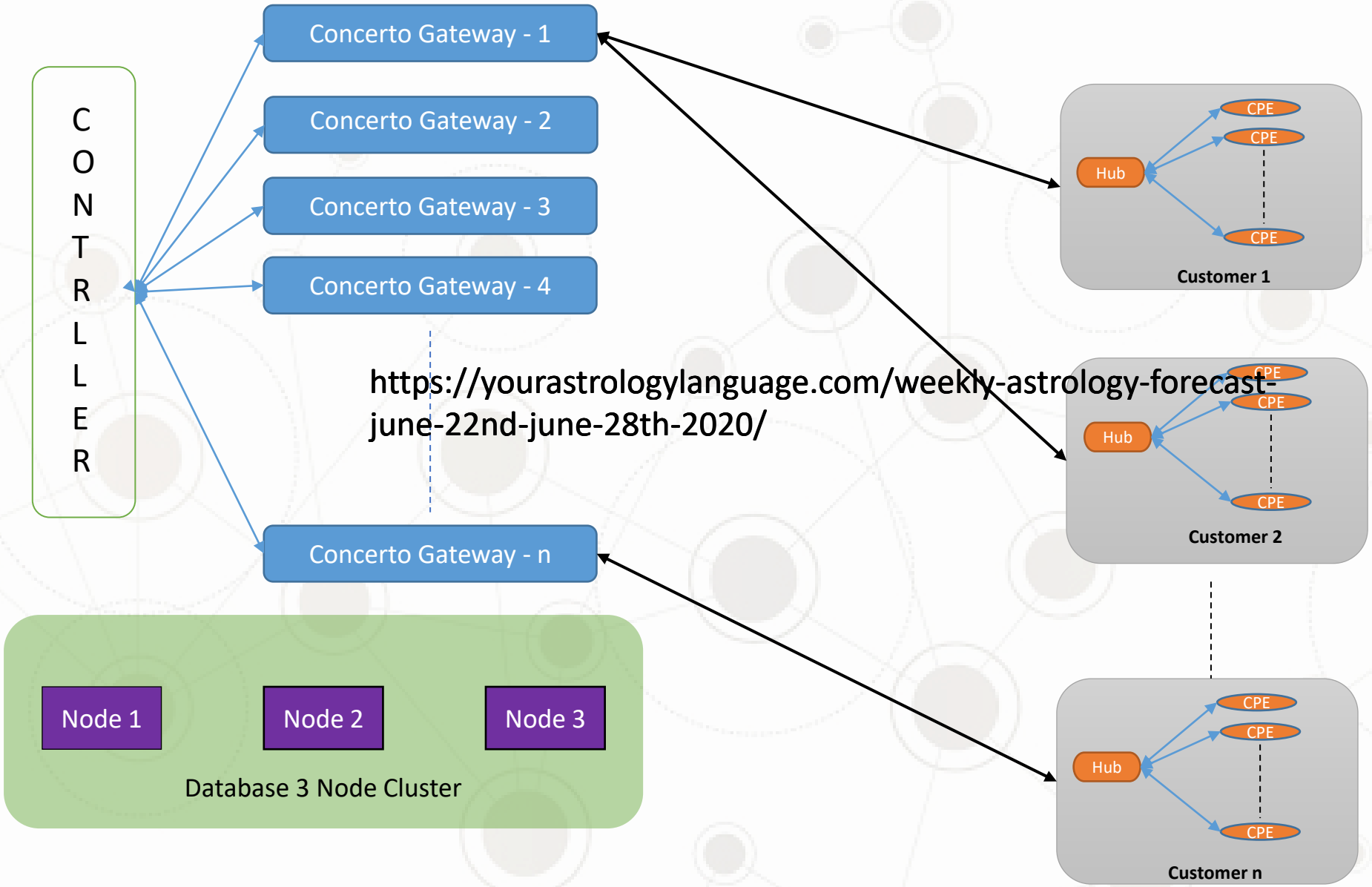


# SDWAN controller Scalability




NUVISO