

# Nuviso Symphony Interlude Automation Suite (NIA)

#### A Network and Service management and automation platform

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### What Does Nuviso Networks Do?



#### Enables Network Agility for Enterprise and Telco Operations

COMPANY

PRIVATE

HYBRID

Heterogeneous

**Environments** 

**Physical** 

Virtual

COMMUNITY

PUBLIC



Simplicity Agility

Define

Deploy

Scale



E2E Network

Core/Transport

Branch/Edge

Cloud/DC

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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	<ul> <li>Programmability &amp; Service abstractions / API-based management</li> </ul>
	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



- Applications
- Network Services

- Stitching/Chaining
- Scale-out/Scale-in
- Analytics and Automation
- Deploy in any Domain
- Service Monitoring
- mation Auto Rollback

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

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



### Nuviso Value Proposition – Manage & Automate Multi-Vendor Telco and Enterprise Networks with Agility



# Some use cases addressed across Telcos and Enterprise Customers



# **Solution Overview**

#### Interlude



#### Orchestration support available at

- Individual element level for feature configuration
  - OSPF, BGP, MPLS, ACLs etc
- Service orchestration across multiple network elements
  - Layer 2, Layer 3, Multicast VPNs, Firewall Policies, VNFs
- Cross domain orchestration (Hybrid)
  - Service originating in campus, traversing through SP cloud, and continuing through a VNF Service Function Chain in the Data-center



- Cross domain orchestrator with TOSCA/Yang model inputs
- Campus & SP-core networks orchestration using Openconfig Yang models
- Data Center Virtual Networks orchestration using ETSI MANO ref. arch.
  - With support for auto scale-in/scale out of VNF functions
  - Rich monitoring and analytics using streaming telemetry
  - VNF onboarding, Service definition work bench and forwarding graphs

# **Solution Value Proposition**

- Brings programmability to legacy network elements without changing existing software
- Dynamically extensible for multiple verticals (e.g. wired & wireless) and configuration models using simple plugins
- Model driven integration with OSS/BSS
- Ability to push config using config templates defined in industry standard yangs
- End-to-end network-wide service automation and orchestration
- Time-series tracking of telemetry data and ability to use advanced analytics
- GIS based topology visualization
- Powered by Nuviso's patent-pending model-to-configuration mapping engine
- Multi-tiered architecture for horizontal scaling

### EMS vs Interlude

EMS	Symphony Interlude
	Generic manager/orchestrator not tied with any
Purpose built for each Network Element	specific device
Built and supplied by the OEM supplying the	Developed by a neutral orchestration software
network element	vendor
Works only with the specific vendor device	Multi-vendor capable
	Understands configuration both at an individual
Can only push specific configuration for	device level, as well as at a service level (Service is a
devices, or collection of devices. No notion of	collection of configurations spanning across multiple
a 'service'	nodes. Eg: Layer2 VPN, Layer3 VPN etc)
APIs are largely unsupported. In cases where	
an EMS supports API it is both vendor specific,	Standards based APIs based on IETF/OpenConfig
and proprietary	Yang models
Not dynamically extensible. Needs vendor	
help/support to add new APIs or configuration	Dynamically extensible for new services, devices,
parameters	config features by hot deployable yangs and plugins

## Interlude Architecture

- IETF/OpenConfig Yang models compliant
   platform
- Nuviso Yang Mapper converts raw commands of the device to/from industry standard yang models
- Device support packages dictate the semantics of this conversion
- Multiple south bound protocols, but consistent north bound API
- Agentless architecture to convert legacy device interface to programmable interfaces
- Well defined separation between operational and config views



# Interlude – Theory of Operation

- 1. EMS calls APIs to push a configuration
- 2. Interlude stores user given config data to its <u>Config Data Store</u>
- 3. Interlude then pushes the config to device using the device plugins
- A periodic config audit job pulls config & operational data from the devices, and stores it in the <u>Operational Data</u> <u>Store</u>
- 5. The Config Change Audit job tracks two events
  - a) Change history
  - b) Config inconsistencies against golden configuration



### **Product features**

- ✓ Connection Profile Management
- ✓ Device Management
- ✓ Device Discovery
- ✓ SSH transport
- ✓ RESTCONF server with auto-generated yang APIs
- ✓ Device Plugin Management
- ✓ Automated Periodic inventory and Topology
- ✓ Automated API spec generation for yangs
- ✓ Device configuration push support
- ✓ Service configuration push support
- Comparison between Config and Operational state & flag conflicts
- ✓ Licensing
- ✓ Job framework
- Device Plugin Management Updates support for inheritance/override, encryption of plugins, support loops, etc.
- ✓ Yang Schema for APIs
- ✓ Hot deploy of Yangs and Plugins
- ✓ Transaction Management

- ✓ Device Grouping
- ✓ Concurrency in config push
- ✓ Job summary to capture device interaction
- ✓ Extensive Serviceability & Debuggability features
- Filtering / Pagination / Sorting for building meaningful Uls
- ✓ Yang 1.1 support / Compliance to RESTCONF standard
- ✓ Any Operation as a Job, for better tracking
- ✓ Command caching
- ✓ Config Archival & Restoration
- ✓ Selective Inventory/Versioning
- ✓ Monitoring / Telemetry
- ✓ Embedded TFTP server
- ✓ Service Input Validation
- ✓ Service Push Verification
- ✓ Service health monitoring/discovery
- ✓ Dashboard UI
- ✓ Role based access

# **Configuration Management – Key functions**

SI No	Config Management Function	Interlude support
1	Config Audits and Reports	$\checkmark$
2	Historical analysis of config changes	$\checkmark$
3	Policy Compliance for configuration push	On Roadmap
4	Config Backup & Disaster Recovery Support	$\checkmark$
5	Automatic / Scheduled config push	$\checkmark$
6	Run-time config change detection	$\checkmark$
7	Asynchronous alerts	On Roadmap
8	Config Templates	Realized using Yang Models
	Other Functions	
9	Inventory and Topology	$\checkmark$
10	Workflow Management	On Roadmap
11	License Management	On Roadmap
12	Image Management	On Roadmap
13	Automatic UI generation for EMS from Yang Models	$\checkmark$

### Use case -- Common Intent Based Policy Interface

- Multiple VNF vendors follow different configuration mechanisms. This results in manual efforts to migrate policy/config from one vendor to another vendor
- Nuviso solution
  - This problem is very similar to the legacy config unification problem. With different transport gear vendors supporting different models (Eg: Cisco vs Juniper), the popular choice is to use standard yang models
  - Nuviso solution manages vendor VNFs via well defined yang models so that vendor migration can be made seamless
  - Day-0 config can also be automated using yang compliant configuration sections in the NSD that are autoapplied during service instantiation
  - Already POC'd in a North American Tier-1 SP

# Use Case -- VNF Day-1+ Configuration

- Yang model driven schema for day-1 VNF configuration
- RESTCONF APIs generated from yang models
- VNF Modify operation consume the yang modelled data and invoke corresponding Interlude APIs
- Auto-generated UI from the yang model for VNF configuration



### Use Case – Configure/Automate VNFs for Virtual Private Cloud

#### Customer: Tier 1 North American Service Provider

**Scenario:** Build/Automate Virtual Private Cloud with existing 30+ different VNFs, (ex: vRouter, LB, Firewall) to offer services to enterprises.

- Interlude: Mediation platform for service orchestration engine for physical networks for multitude of services across different platforms.
- Abstract complex multi-vendor configuration nuances to simplify automation layer
- Leverage as a config automation engine for VNF migrations across different vendors.
- Accelerate time to market by focusing on their specific solution offering and packaging





### Use Case – Reduce Configuration Time of Network Devices Efficiently

#### **Customer: Asian Service Provider**

**Scenario:** Enable new multicast sources for high speed Internet and IPTV services for business and residential customers.

- Interlude: Configure ~2500 PoPs with ~700 MPLS/Routing nodes and 1800 OLTs faster.
- Reduce time to enumerate device list to be changed, identify the OS-type and push the specific config changes.
- Deal with different means of configuring IGMP SSM for different platforms (IOS-XE/IOS-XR).
- Interlude took ~13 minutes for pushing config to 591 multi-platform devices as opposed to 290-350 person hours earlier.



# Use Case – TM Forum Catalyst



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### **NIA Benefits**

- API gateway for physical/legacy networks that are not natively programmable, using
   standards based data models
- Single point interface for configuration push into devices, serving both IT administrator's toolkit, or from the OSS as a result of customer facing configuration
- Configuration and Service audits, time-series-analysis of configuration events
- Policy compliance for configuration push and automatic/scheduled configuration changes
- Single source of truth for the network state and configuration, irrespective of whether the configuration is pushed via NIA or directly done on device
- Service to resource mapping

