



CLOUDIFY

Model Driven Orchestration for SD-WAN, vCPE,
And Virtual Edge

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The Evolution of Enterprise WAN

SD-WAN, vCPE & Virtual Edge are the fastest growing and most disruptive market drivers that are addressing the Evolution of the Enterprise WAN. Adoption of public cloud, mobility, real time video and VOIP and the ever growing demands for bandwidth have forced CSP's to re-think the way that WAN connectivity and associated network services are designed, delivered and priced. Enterprise customers are asking for connectivity services that can easily and intuitively connect users, applications, data, devices, locations and public clouds, they are looking to be empowered by self service portals than will allow them to consume and manage these services and are looking for new business and pricing models that can enable to rapid change.

CSP's that are looking to offer these services must be able to rapidly adopt new ways of thinking, designing and delivering network connectivity services.

Cloudify to the rescue

Cloudify is a Model Driven, TOSCA based, Open Orchestration Platform that is the perfect solution to enable CSPs address the challenges ahead. Cloudify takes an "Orchestration First" approach that allows CSPs to design and deliver network and connectivity services that are:

- Built for Automation, integration and Self-Service
- Technology neutral and free of vendor lock-in.
- Allow CSPs to leverage their existing network assets, knowledge and skills
- Avoid the "Turnkey solution trap"
- Innovative and relevant to their end users

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Business Benefit for CSPs

The *orchestration-first* approach is a Top-to-Bottom service design process that starts with defining and modelling the Service Intent, its requirements and options and its operational, commercial and delivery models, this approach leads to a better and faster time to value and allows CSPs to take full advantage of all their existing assets, skills, market position and growth potential.



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Additional business benefits

- Platform for enabling CSP **innovation** and **transformation**
- **Faster ROI** through adoption of new technologies service agility
- Use of **shared resources** allows to reduce the license cost per PNF, VNF through better utilization of the existing resources amongst the existing customers.
- **Full automation** of the end to end service lifecycle allow to reduce the labor cost that is often associated with each service interaction activation
- **Reduce license cost by avoiding lock-in** and use of open-source models allow better bargain position with infrastructure and VNF vendors and also provide the flexibility to introduce new VNF and infrastructure providers without breaking the existing system.
- **Better support and user experience** - having a fully automated and tested flows is simpler to manage and support in a predictable fashion as opposed to interacting directly with each device which is considered more complex and error prone.
- **Leverage existing assets** - the use of existing PNF, VNF and infrastructure first approach enabled to leverage existing skills and significantly reduce the time it would have taken to deploy the new service
- **Fast deployment of new services** - the new infrastructure provide a single point of access to the entire networking infrastructure through a single API. This would reduce significantly the ability to launch new services on top of the new platform as many of complexity that was usually involved in such project in now carved out completely.

Cloudify Open Orchestration Platform Solution

Model Driven & Orchestration-first approach

Next Generation WAN and Connectivity services are about being able to dynamically and modularly reassemble network assets, devices, functions and location in ways that can support the requirements of enterprise customers.

Model Driven Orchestration is a process that model each one of these assets independently and then assembles them together to form the complete service, this is also called composable service, this can be used to realize many types of WAN and Connectivity services for example: vCPE, SD-WAN, Virtual Edge and the combination of all of them.

Key features

Cloud Native Service Chaining

Cloudify uses a Model Driven Microservices approach to model network services and their



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dependencies into a service chain. In this way network services can be modeled and provisioned independently from one another. The service chaining between those services is deployed as an overlay service that stitch together the input and output from each service.

Each service expose a set of workflow that abstract the network configuration of each device.

In this way new services can be added to an existing service chain. In addition to that the logic of the service chain is decoupled from the actual underlying network device and therefore allow easier path to change the devices and still maintain the same service flow.

Custom Multi Tenant Portal

Designed to allow customization of the specific VNF configuration screens, maps and logo etc.

Generic VNF Configuration toolkit (Netconf, YANG, mor)

Based on a cloudify netconf plugin. The configuration toolkit allows to templatize the configuration files that are passed into the device with input from the orchestrator engine.

This model provide a flexible integration point to manage large variety of devices without the need for specific integration with each one of them.

Simple VNF Onboarding toolkit

The VNF onboarding toolkit provide a simple wizard for automating the provisioning of new VNF. The wizard auto-generate a TOSCA template. In this way users wouldn't need to have advance TOSCA background to automate the onboarding of VNF and could also shorten the learning curve substantially.

Custom Monitoring

Cloudify comes with built in open metrics database as well as monitoring agents. The data from the agents sent into the metrics database and can be presented in various format through the web user interface.



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Case Study

Open VCPE and SD-WAN for a Leading EMEA Operator

Company size: 3M+ Subscribers

Goal

Deliver a VCPE and SD-WAN solution that integrates with their existing CPE and brown field network devices while at the same time allow flexibility to plug new VNFs and Cloud Infrastructure for NFV.

Environment

- CPE - Juniper
- VNF - Fortigate
- VIM - VMware

Requirements

- Self-service, end to end automation, "order to delivery" is measured in seconds
- Agility, decreasing time to market
- Flexibility, efficient handling of variability
- Cost, scaling effectively from small to large solutions
- Scales from a 100% manually configured solution to a complete self-service solution. Same SW/interfaces used.
- Customer specific report on the utilization of their service on relevant KPI's
- Service Modeling
- That it is easy to add new features
- End-to-end orchestration across NFV and SDN
- Instant activation of the NFV
- Service Chaining
- 99.999% availability
- High performance in all of the layers in the data center
- DC integration to the back bone
- How to handle the split between initial operator configurations and customer configurations
- End-to-end monitoring
- Operational tools
- Troubleshooting tools

- Capacity management
- Scalability
- Security including logging on all levels
- Protocols / standards used, including openness for 3 party delivered services
- Maturity of the involved technologies and standards
- The split between which services to realize centralized, and which needs to remain on the CPE

Key Challenges

- Aggressive timeline and low budget constrains
- The main challenge in this project is that the customer needed to deliver a first release of the solution in 3 months and under extreme low budget.
- Skillset - No previous knowledge of cloudify or cloud best practices.

Alternative solutions and approaches

Top tier network provider that was allready installed in the account and was willing to provide orchestration at no cost.

The customer also considered the use of Turn-key SD-WAN and VCPE solutions but decided to drop this option due to the fact those solution didn't fit well with the existing environment and business model that the operator wanted.

Reasons for selecting Cloudify

- Open TOSCA based solution
- Allowed high degree of customization and integration with their existing environment
- Business - Lowest initial investment and fastest path to reach first production launch.

Open VCPE Solution

It was clear that taking the traditional infrastructure first approach wouldn't work as it wouldn't fit either the time or budget limit.

That forced us to think of an alternative approach and that's how we came up with the Orchestration/Automation first approach which allows to focus first on optimizing their existing assets and infrastructure and only than introduce new cloud services.

By taking the automation and orchestration-first approach we didn't have to invest any time or \$ in changing the environment, build new skillsets and invest in a new infrastructure but rather integrate directly with the existing production environment and OSS/BSS.



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The generic network configuration plugin was served as a key enabler as it allowed to automate the configuration of the existing devices by templating the same configuration that was used by the operator to configure those devices manually. That allowed the operator to also leverage the existing skillset and knowledge and quickly ramp-up the internal team to take ownership of the solution and be self-sufficient in adding new configuration, devices etc.

The plugin approach of Cloudify allow to integrate all of the parts that takes part in fulfilling the service including the integration with sales and marketing team as well as connecting greenfield and brownfield environments, by providing:

- Self service of the various parts of the solution (IP addressing, firewall , DNS)
- LAN / WAN dashboard – reporting and real-time overview of the solution, traffic etc.
- Integration with legacy OSS is emulated
- Integration of CPE required
- How to control the customer solution using customer profiles

All of this based on standardized telco ETSI cloud, with out of the box service function chaining, across multiple locations.

This PoC successfully demoed all of the requested use cases and showed how performance gains of up to 450 %can be achieved on the same lines and CPE equipment by offloading work to the vCPE.

Solution Demo

- [Video](#)
- [Use Case](#)

Read More - Architecture patterns for building large scale open VCPE solution

- [Building Large Scale Services with Micro Services, TOSCA and Cloudify](#)
- [An Open Source, Dynamic, and Integration-Based vCPE/SD-WAN Orchestration Service Built with Cloudify](#)
- [Technical Patterns](#) - Open vCPE design patterns with TOSCA and Cloudify Service Chaining



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