Case Study: Orchestration of Hybrid Networks

Achieving End-To-End Service Orchestration across Hybrid Networks
Windstream is a U.S. based FORTUNE 500 company and a leading provider of advanced network communications and technology solutions.

**SDN Services**
- Optical Wave
- Carrier Ethernet
- SD-WAN
- Broadband Element Commissioning

**Our Services:**
- Data Networking
- Core Transport
- Security
- Unified Communications
- Managed Services
- SD-WAN
- Broadband
- Entertainment

Windstream
Residential, Small Business, Enterprise and Wholesale Business Segments
Trusted partner to leaders in the communications industry, including Fortune 500 customers and 95% of clients have re-engaged.

Right-Sized, Flexible Partner with multi-shore delivery model.

Portfolio:
- RPA/Telebots
- SDN/NFV
- AI/ML & IoT
- O/BSS and BPO
- DevOps & Microservices

$1.3 Billion
64 Locations
16,500 Employees

35%+ YOY Growth

Who We Are

Key Clientele:
- Liberty Global
- CenturyLink
- AT&T
- Windstream
- Verizon
- Sprint
- T-Mobile
- KPN
- Hosting
- Spectrum
- Tele2
Reduce service delivery time

Revenue & margin growth

Seamless capacity management

OPEX and CAPEX reduction

Enhanced customer experience with self-service
Technical Solution

Requirements

- Intent-based, multi-domain service orchestration
- Flow through automation
- Network-based topology database
- Interoperability between legacy and SDN-enabled network appliances
- Avoid vendor lock-in
- Microservices-based deployment architecture
**Architecture Vision for Based Multi-Domain Orchestration**

**Key Considerations:**

- Cloud infrastructure at core, edge & premises
- Public & private cloud tight coupling for service chaining
- Programmable optical network optimizing traffic flows
- Overarching service orchestration across physical & virtual network
Sample multi-domain, multi-vendor ecosystem architecture

What we did?

1. Northbound Interfaces (NBI)
2. Service Templates (TOSCA/HEAT)
3. Southbound Interfaces (SBI)

E.g. Challenges mitigated

- Lack of open APIs for OSS
- Lack of single source of truth e.g. inventory data
- Lack of legacy network programmability
- IT & network skillset bridging
4 Switching & routing enhancements

What we did?

Enabling switches and routers to support centralized configuration

Configure YANG/network configuration models

E.g. Challenges mitigated

• Many vendor specific features still not available as YANG models
• Standard configuration not available across all vendors
• Developed CLI-based adapters and Python based APIs
DevOps/Agile and testing framework

DevOps/Agile Framework
• Automating planning → Deployment CI/CD pipeline

Testing Automation Framework
• Automating system, Interoperability and integration, Simulation testing across domains
  • For CE 2.0 (E-Line, E-Access), L2/L3 VPN, Wave, SD-WAN, vCPE.

E.g. Challenges Mitigated
• Change requests approval
• Policy constraints for code change in production
6 Enabling closed loop assurance leveraging AI/ML

E.g. Performance Management (PM) Data

Machine Learning Algorithm

Predicts events of different severities based on the intelligence built

What we did?

Big data lake implementation

Custom graph visualization

Data prediction PoC & porting into production

E.g. Challenges mitigated

- Skills pivot for big data lakes, analytics, AI and ML
- Custom ingestion code i.e. integration various data sources such as alerts, performance, ticket
- Visualization tool development & mail integration
- Model selection & training

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Applications Operation and Maintenance

What we did?

- Proactive operation and maintenance ensuring application availability
- Proactive application upgrade and enhancement based on product rollout

E.g. Challenges Mitigated

- Seamless multi-vendor, multi-domain production environment upgrade
- Network traffic and application load balancing
Managed Network Upgrade – Enabling SDN Features

What we did?

- Automated bulk firmware and software upgrade, enabling SDN features
- CLI-based automated bulk configuration across managed routers via orchestrator

E.g. Challenges mitigated

- Heterogenous network elements and software levels
- Multiple legacy NMS and EMS systems
What We Did

To enable E2E Service Orchestration in Hybrid Networks

1. Southbound Interfaces (SBI)
2. Service Templates (TOSCA/HEAT)
3. Northbound Interfaces (NBI)
4. Routing and Switching Enhancements
5. DevOps and Testing Automation
6. Closed Loop Assurance with AI/ML
7. Applications Operation and Maintenance
8. Managed Network Upgrade
9. Open Source Solution PoCs

Solution Platform Advisory
Key Challenges

- IT and network skillset combination
- Legacy network programmability
- Moving to agile and DevOps
- Virtualization adoption
- Network automation
- Business and architecture ongoing involvement

...Mitigated

- Partnerships (Prodapt, OEM vendors), Skills pivot & Cross-trainings
- Plan-prioritize relevant user stories
- Automated key aspects of CI/CD/CT
- Early wins on agility and TTM for service delivery
- Vision alignment and management sponsorship
01 Model-driven Configuration Templates
Network abstraction based on YANG Model for templatized configuration

02 API-driven Automated CRUD
Automated service creation based on user configurations via APIs
Only specify CREATE operations, REDEPLOY, UPDATE, DELETE, auto-generate

03 Transactional Guarantees
Reduced manual intervention with templates configuration and automated CRUD
Ensure fail-safe operations

04 Enabling Self-healing Network
Data Analytics systems and DSP Data Lakes can be integrated for telemetry forecasting and analysis
Enables error forecasting and demand patterns

Key Learnings
From ongoing deployments

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Ensure fail-safe operations
**Benefits to our customers**

Via an automated provisioning in multi-vendor, multi-domain ecosystem in conjunction with our customer ecosystem

- Reduced time to rollout new services
- Faster revenue & New revenue
- CAPEX/OPEX reduction
- Better customer experience