Future of Network and Service Automation

IEEE NOMS Distinguished Expert Panel

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Network Slicing - The foundation for future value creation

Service Request

Slice Request Attributes
Latency:
Throughput:
Reliability:
Mobility:
Geography:
Security:
Analytics:
Cost profile:
…

Composable Network & Service Resources

- Application Logic
- Augmented Services
- Virtual Network Functions
- SW-Defined Connectivity
- Cloud Infrastructure

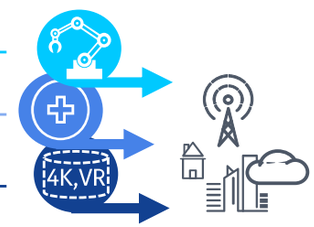
Network & Cloud Orchestration

Automated composition & operations

Service Specific Network Slices

Service Delivery

High performance localized delivery



E2E virtual network optimized for specific tenant, service or service class with dynamic adaption and automated monitoring and control

Application | Core | Transport | Access | UE

Network slices are end-to-end 'virtual private services'

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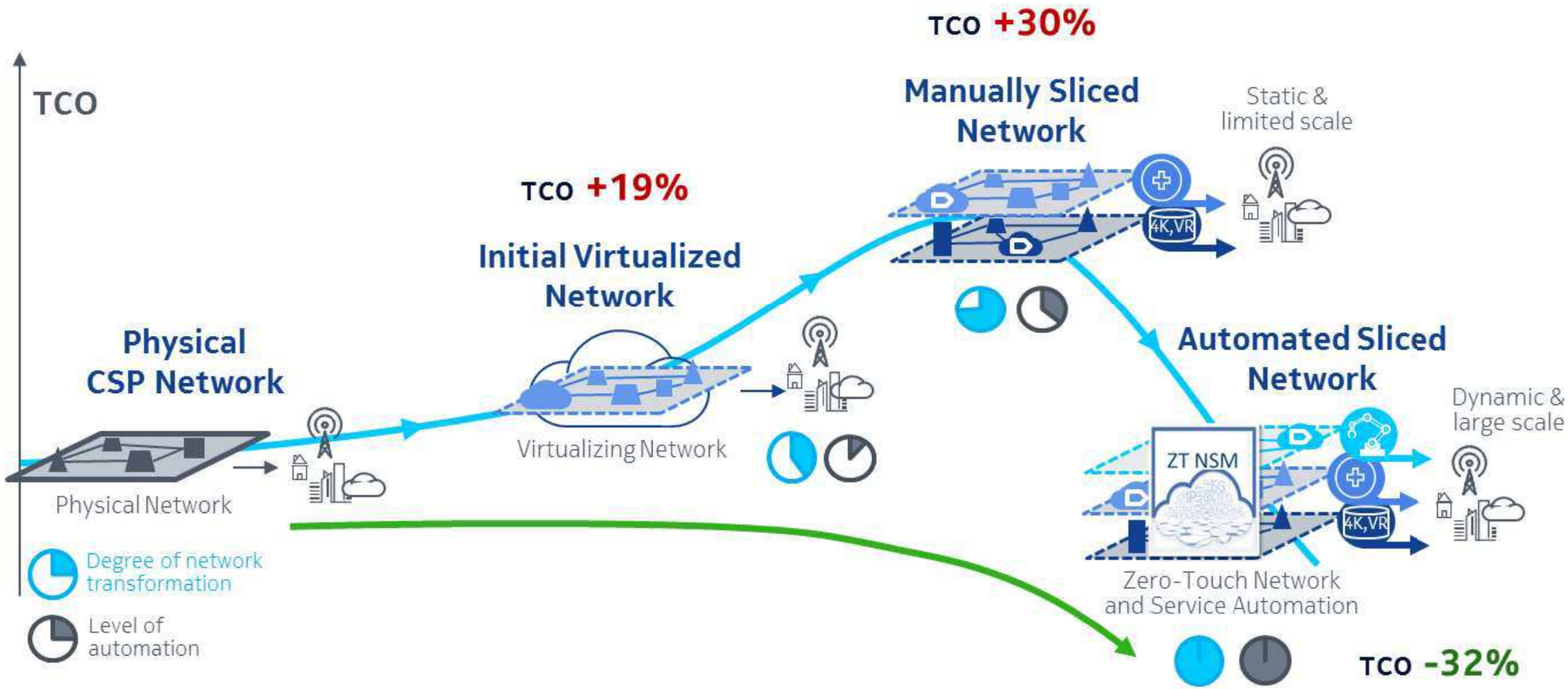
Network and Service Automation are essential to DSP economics



Source: Bell Labs Consulting

Without E2E automation NFV/SDN & network slicing add significant cost and complexity

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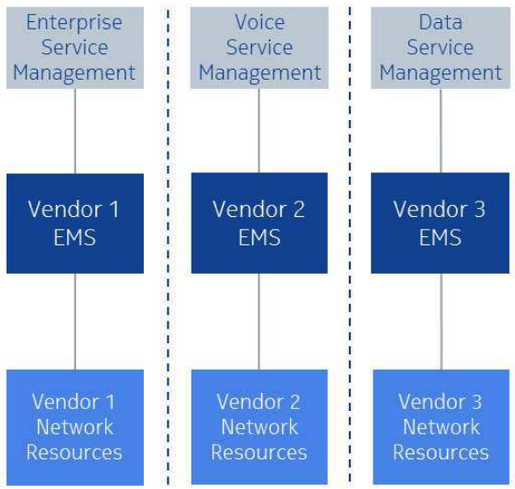
Perspective: Evolution of network management architectures
From silos and custom integration to full multi-domain automation

Increasing operational complexity

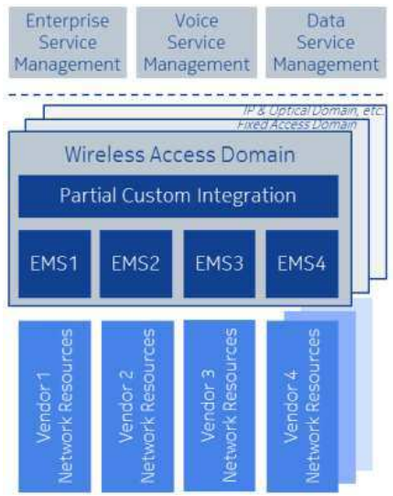
Operational agility and efficiency

Single-Vendor Domains



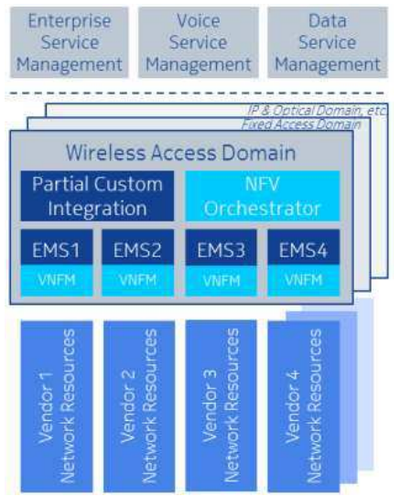
1980 - 2000

Multi-Vendor Domains



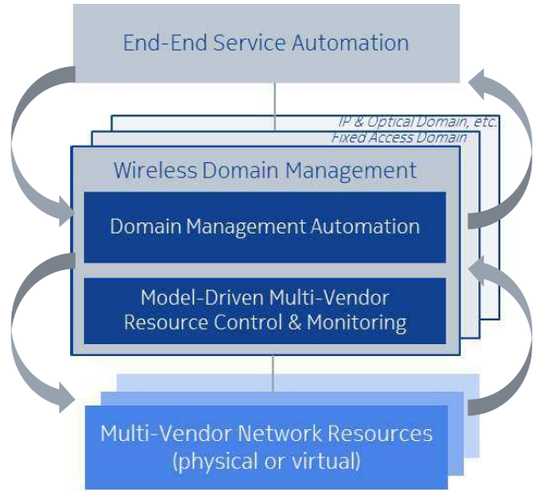
2000 - 2012

Network Virtualization



2012 - 2018

Network Automation



Beyond 2018

A new architecture is required to enable network and service automation

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Network automation

Multi-level automation

Automation: the action of making a task executable without human intervention

Automation applies from individual **functions** to **orchestration** of entire **chain of automation** i.e. workflows

Automation must apply **inside and across domains** e.g. enabling end-to-end slice provisioning

Automation challenges

Diversity. How to design automation **patterns** applicable to the heterogeneity of devices and components

Reliability. How to avoid **massive error propagation** when extreme automation is deployed

Uncertainty. How to automate when faced with lack of knowledge or variability of the environment or conditions

Automation means

Means for automating Measurement
by using streaming telemetry and analytics to generate actionable insights

Means for automating Learning
by using machine learning to identify patterns and enable predictive operations

Means for automating Decision
by using cognitive and adaptive closed control loops to produce effective (re)action plans

Means for automating Management
by using powerful, declarative abstractions (e.g. intents)

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Perspective: Evolution of network management automation
From reactivity to zero-touch automation

	Past	Present	Future
Network/service operations	Reactive	Proactive	Zero-Touch
Level of automation	Low: single task	Partially automated processes	Closed-loop network and service automation
Intelligence	Descriptive & diagnostic analytics, for example anomaly detection	Predictive analytics, e.g. for maintenance/repair	Prescriptive analytics & machine intelligence
Network agility	Static network	More dynamic with partial software control overlay	Fully programmable with embedded software control

Source: adapted from Analysis Mason

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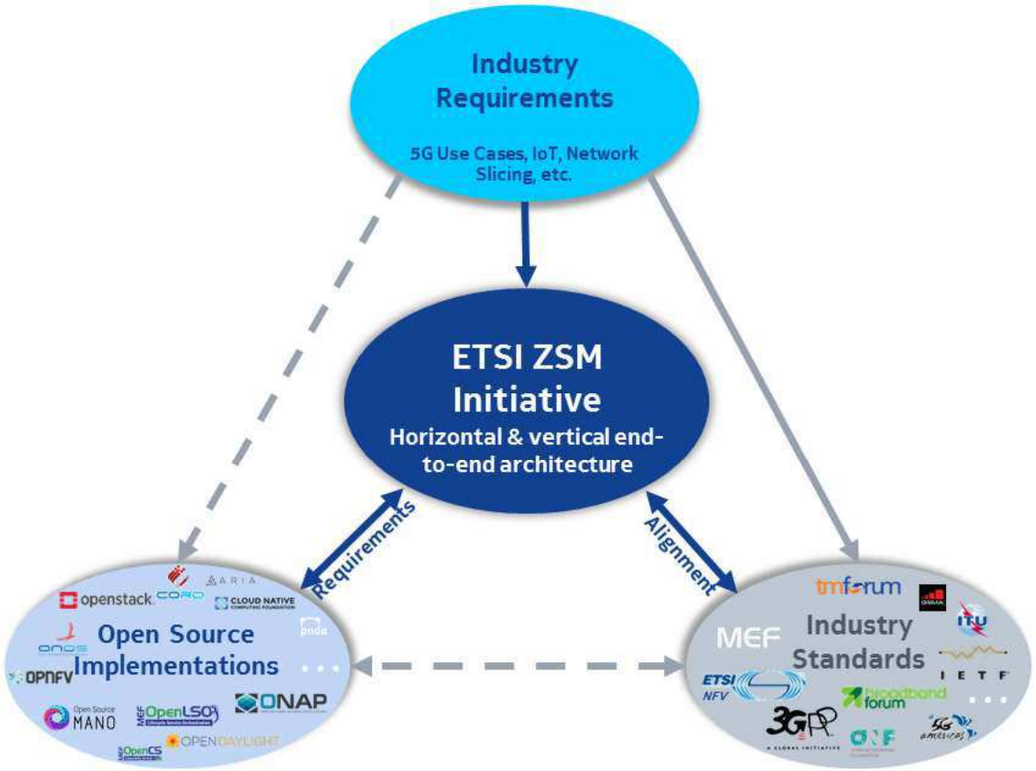
Industry alignment: ETSI ZSM has a central role in the automation ecosystem



- ETSI Zero touch network and Service Management (ZSM) has a pivotal role in bridging between holistic end-end automation and other standardization bodies or open source projects
  - Requirements derived from use cases
  - Architecture for management/automation
- Open-source projects like ONAP should focus on implementation and validation
- Alignment discussion with LNF and ONAP already started

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ETSI Zero touch network and Service Management (ZSM) group

ZSM objectives:

- Define an end-to-end automated network and service management architecture
- Support both legacy and virtualized network infrastructures
- Collaborate with relevant open-source projects, standardization bodies and fora
- Create a foundation for diverse open source groups to produce interoperable solutions

The ZSM group continues growing in a steady pace

ZSM leadership:

- Chair: Klaus Martiny, DT
- Vice chairs:
  - Nurit Sprecher (Nokia)
  - Christian Toche (Huawei)
- NOC Advisory Group Chair: Ashiq Khan (DOCOMO)

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ZSM deliverables and milestones

Work item number	Title	Rapporteur	Early draft	Stable draft	Final draft for approval
ZSM 001	Use cases and requirements (specification)	Michael Klotz (DT)	March 2018	Oct 2018	Nov 2018
ZSM 002	Reference Architecture (specification)	Uwe Rauschenbach (Nokia)	Feb 2018	Jul 2018	Sep 2018
ZSM 003	End to end management and orchestration of network slicing (specification)	Zou Lan (Huawei)	Jun 2018	Sep 2018	Nov 2018
ZSM 004	ZSM Landscape (report)	Wu Jinhua (ZTE)	Jun 2018	Sep 2018	Nov 2018
ZSM 005	Means for Automation (report)	Andreas Krichel (HPE)	May 2018	May 2018	June 2018
ZSM 006	Proof of Concept Framework (specification)	Klaus Martiny (DT)	March 2018	March 2018	April 2018

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Epilogue:

We have just embarked on an exciting journey towards the automation transformation that will help operators to meet user expectations for service agility and create new business opportunities.

All network domains are impacted and re-architecting of the service and management software layers is required.

Key success factors:

- An industry environment that works with full synergy and alignment, converging around a single architecture
- Seamless integration of existing and new automation techniques to enable autonomous networks (driven by intents), automated service order management and service optimization.

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