



# ZSM - Aspiring to (Full) Automation

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# The Automation Aspiration

Fully autonomous networks

- After the automatic and autonomic stages

Based on a definition of policies and goals

- Network intents
- Policy enforcement and propagation

Detection and action

- Dynamic identification
- Adaptable response

Well-known closed-loop approaches

- Software network techniques to support elasticity and programmability
- AI to derive further insights and improve policy mapping



# The Network Automation Puzzle

## Addressing Heterogeneity, Supporting Diversity

Networks are critical and naturally distributed systems

- Calling for distributed mechanisms for managing them

Beware the network differential facts

- Topology (and geometry!) awareness
- The conservation principle
- The laser effect(s)
- Radical openness
- Integrity and auditability
- Isolation

Multi-domain and (close to) real-time

- Depth: local vs holistic



# The ZSM Mission

Define a future-proof, **end-to-end operable framework** and **solutions, key automation technologies** to enable zero-touch automation emerging and future networks and services.

The ultimate target is to **enable autonomous operations** (self-configuration, self-monitoring, self-healing, self-optimization, self-protection) empowered with advanced cognitive capabilities and driven by high-level business policies.

Realizing this vision requires a new end-to-end architecture framework **designed for closed-loop automation** and **optimized for data-driven artificial intelligence algorithms**.

# The Landscape for Network and Service Automation

A first take at a fully converged telco network approach

## End-to-end service management domain

- Orchestration, SLA enforcement and assurance (incl. closed loop) of E2E services/slices
- Decomposes high-level parameters
- Allocates SLA budget to domains
- Has an abstracted view of the domains' services/sub-slices

## End-to-End Service Orchestration and Automation



## Management domains

- Resource orchestration, SLA enforcement and assurance (incl. closed loop) of domain-wide services
- Interprets and translate high-level parameters into domain-level resources
- Decides #V/C-NFs and their placement

### Access Domain Management



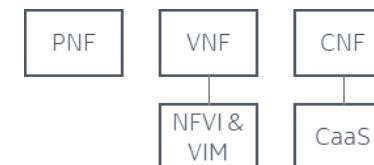
### Transport Domain Management



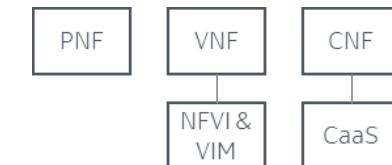
### Edge, Core and Service Domain Management



## Domain-managed resources



### Transport Network



End-to-End Framework, Key Automation Technologies and Security



# The ZSM Topics

## End-to-end architecture framework

- Designed for closed-loop automation
- Optimized for intent driven mechanisms and AI algorithms
- Based on well-established architectural principles

## Closed-loop and AI enablers

- Uniformly manage their lifecycles, including dynamic management
- Coordinate their execution, including composition

## Intent

- Key enabler for autonomous networks
- End-to-end aspects and conflict handling

## Security considerations

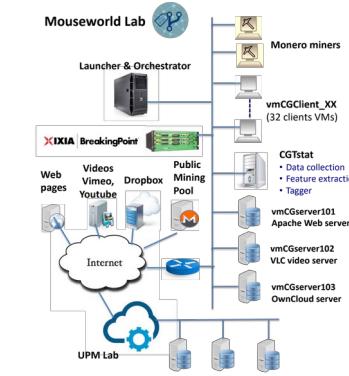
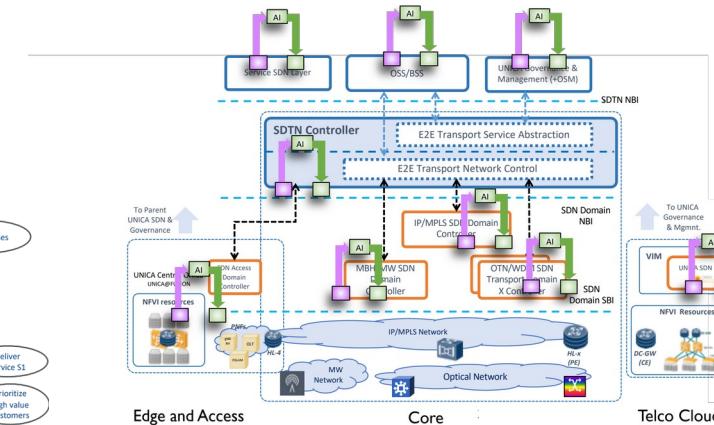
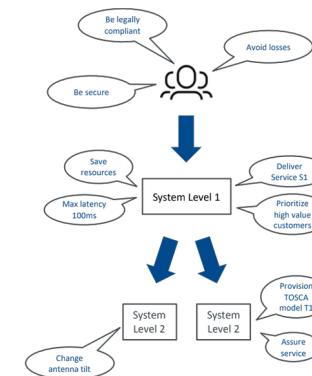
- The ZSM framework
- The enabling technologies

## Network Digital Twins

- Planning, what-if analysis, decision-making, troubleshooting...
- (Human and non-human) training

## And their interactions

- Intent-driven and cognitive closed loops
- ...



# The Demonstrative Side

Build awareness and confidence and encourage development of an open ecosystem

- Demonstrative deliverables, in addition to informative and normative ones

Look for practical results

- Explore technology options
- Facilitate gap analysis
- Contribute to guide the future ISG activity

Lightweight process

- Few (objective) requirements to file a PoC proposal
- Run PoC project
- Openly report results to the community

A key tool for collaboration with research and industrial initiatives



# A Practical Example - ZSM PoC#8

## ZSM+F5G Solution to CAMARA NaaS Platform

ZSM PoC#8 uses ZSM framework to build a NaaS platform which allows app developers to build services (e.g., cloud VR gaming) via CAMARA APIs. The PoC also uses F5G optical network for high-quality VR applications.

# As Conclusion: How ZSM Plays Downfield

More a reference than a prescriptive one

- Facilitating interoperability as main goal
- E2E, multidomain view
- Stressing demonstrative results
  - PoCs
  - Research reference (e.g., in 6G)

Moving *downfield*

- Strengthen collaboration activities
- Identify and transfer "prescriptable" results
- In currently open collaborations and beyond

A football receiver running straight downfield at 5.50 m/s is 10.0 m in front of the quarterback when a pass is thrown downfield at 25.0° above the horizon (Fig. P3.58). If the receiver never changes speed and the ball is caught at the same height from which it was thrown, find (a) the football's initial speed, (b) the amount of time the football spends in the air, and (c) the distance between the quarterback and the receiver when the catch is made.

