ETSI GS ZSM 001 V1.1.1 (2019-10)

Zero-touch network and Service Management (ZSM); Requirements based on documented scenarios

Disclaimer

The present document has been produced and approved by the Zero touch network and Service Management (ZSM) ETSI Industry Specification Group (ISG) and represents the views of those members who participated in this ISG.
It does not necessarily represent the views of the entire ETSI membership.

Reference
DGS/ZSM-001ed111_UCs

Keywords
management, network, requirements, service, use case

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:
http://www.etsi.org/standards-search

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx

If you find errors in the present document, please send your comment to one of the following services:
https://portal.etsi.org/People/CommiteeSupportStaff.aspx

Copyright Notification

Contents

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (https://ipr.etsi.org/).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Foreword

This Group Specification (GS) has been produced by ETSI Industry Specification Group (ISG) Zero touch network and Service Management (ZSM).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document defines requirements on the zero-touch E2E (End-to-End) network and service management. Scenarios will be documented and used to derive the requirements.

The requirements will also be considered for the work on the topics Zero-touch network and Service Management (ZSM) reference architecture [1], ZSM End to end management and orchestration of network slicing [i.7], and ZSM Inter management domain lifecycle management [i.8].

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents are necessary for the application of the present document.

[1] ETSI GS ZSM 002: "Zero-touch network and Service Management (ZSM); Reference Architecture".

[2] ETSI GS ZSM 007: "Zero-touch network and Service Management (ZSM); Terminology for concepts in ZSM".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI GR ZSM 005: "Zero-touch network and Service Management (ZSM); Means of Automation".

[i.2] ETSI GR NFV-IFA 023: "Network Functions Virtualisation (NFV); Management and Orchestration; Report on Policy Management in MANO; Release 3".

[i.3] ETSI TS 128 530 (V15.1.0): "5G; Management and orchestration; Concepts, use cases and requirements (3GPP TS 28.530 version 15.1.0)".

[i.4] NGMN Alliance: "Architecture Proposal for the Handling of Network Operations Data with Specific Focus on Virtualized Networks", version 1.0, 2017-12-22.

[i.5] ETSI TS 138 300 (V15.6.0): "5G; NR; Overall description; Stage-2 (3GPP TS 38.300 version 15.6.0)".

[i.6] ETSI TS 123 501 (V15.5.0): "5G; System architecture for the 5G System (5GS) (3GPP TS 23.501 version 15.5.0)".

[i.7] ETSI GS ZSM 003: "Zero-touch network and Service Management (ZSM); End to end management and orchestration of network slicing".

[i.8] ETSI GS ZSM 008: "Zero-touch network and Service Management (ZSM); Inter management domain lifecycle management".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI GS ZSM 007 [2] and the following apply:

NOTE: If the same term is defined in both ETSI GS ZSM 007 [2] and in the present document, the definition in the present document takes precedence.

data governance: processes to define and enforce access restrictions to data, and to attach related metadata to the data

federated orchestration: orchestration performed by multiple autonomous management domains

NOTE: Autonomous domains in this context is related to independent (or self-regulating), not to be confused with the degree of automation.

hierarchical orchestration: orchestration decomposed into one or more hierarchical interactions where parts of the service are delegated to a sub-ordinate orchestrator

key performance indicator: measurement of a specific aspect of the performance of a service that can be used in a service level objective

service level agreement: part of a business agreement between a service provider and a customer, specifying the committed service quality and quantity in terms of service level specifications, and the associated consequences in case the service level objectives are not met

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GS ZSM 007 [2] and the following apply:

NOTE: If the same abbreviation is defined in both ETSI GS ZSM 007 [2] and in the present document, the definition in the present document takes precedence.

3GPP	3rd Generation Partnership Project
5GC	5G Core
AI	Artificial Intelligence
AMF	Access and Mobility management Function
AR	Augmented Reality
BBU	BaseBand Unit
BSS	Business Support System
CD	Continuous Delivery
CEM	Customer Experience Management
CFS	Customer Facing Service
CI	Continuous Integration
CPU	Central Processing Unit
CSC	Customer Service Consumer
CSP	Communication Service Provider
DCN	Data Centre Network
DN	Data Network

DNS	Domain Name System
E2E	End-to-End
EMS	Element Management System
ETSI	European Telecommunications Standards Institute
FCAPS	Fault-, Configuration-, Accounting-, Performance-, Security-management
FM	Fault Management
gNB	next generation NodeB
GR	Group Report
GS	Group Specification
GUI	Graphical User Interface
HW	HardWare
IFA	InterFaces and Architecture
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IPR	Intellectual Property Rights
IPsec	Internet Protocol Security
ISG	Industry Specification Group
IT	Information Technology
KPI	Key Performance Indicator
LCM	Life Cycle Management
LTE	Long Term Evolution
M2M	Machine-to-Machine
MANO	Management And Network Orchestration
MEF	Metro Ethernet Forum
mIoT	massive Internet of Things
ML	Machine Learning
MLaaS	ML as a Service
MnS	Management Service
MR	Mixed Reality
NaaS	Network-as-a-Service
NF	Network Function
NFMF	Network Function Management Function
NFV	Network Functions Virtualisation
NFVI	NFV Infrastructure
NFVIaaS	NFV Infrastructure as a Service
NFVO	Network Functions Virtualisation Orchestrator
NG	Next Generation
NG-RAN	Next Generation-RAN
NOC	Network Operators Council
NOP	Network Operator
NS	Network Slice
NSaaS	Network Slice-as-a-Service
NSI	Network Slice Instance
NSSI	Network Slice Subnet Instance
NW	NetWork
OLA	Operational Level Agreement
ONAP	Open Network Automation Platform
OPEX	Operational Expenditures
OS	Operations System
OSS	Operations Support System
PAP	Policy Administration Point
PF	Policy Function
PM	Performance Management
PNF	Physical Network Function
QoE	Quality of Experience
QoS	Quality of Service
RAN	Radio Access Network
REST	REpresential State Transfer
RL	Reinforcement Learning
SaaS	Software as a Service
SBMA	Service Based Management Architecture
SDN	Software-Defined Network

SDO	Standardization Organization
SLA	Service Level Agreement
SNMP	Simple Network Management Protocol
SW	SoftWare
TCO	Total Cost of Ownership
TMF	TeleManagement Forum
TTM	Time To Market
URLLC	Ultra Reliable and Low Latency Communications
VIM	Virtualized Infrastructure Manager
VNF	Virtualized Network Function
VNFaaS	VNF as a Service
VNFM	VNF Manager
VPN	Virtual Private Network
VR	Virtual Reality
WAN	Wide Area Network
XaaS	X-as-a-Service (Anything as a Service)
ZSM	Zero-touch network and Service Management

4 Introduction

The present document describes the scenarios and requirements for zero-touch network and service management investigated by the ETSI ISG ZSM with the focus on automation as well as an E2E perspective.

These scenarios and derived requirements are used in other documents by ETSI ISG ZSM such as ETSI GS ZSM 002 [1], ETSI GS ZSM 003 [i.7] and ETSI GS ZSM 008 [i.8].

The scenarios and requirements allow the ZSM reference architecture and corresponding solutions to be aligned in scope and to be industry-relevant. The scenarios are grouped into key areas for automation and zero-touch operation respectively. They show the value of the ZSM framework reference architecture towards an E2E view and towards automated management functionalities as well as management services applicable to future-proof scenarios. Legacy environments are also considered for incremental deployment of automation and zero-touch technologies.

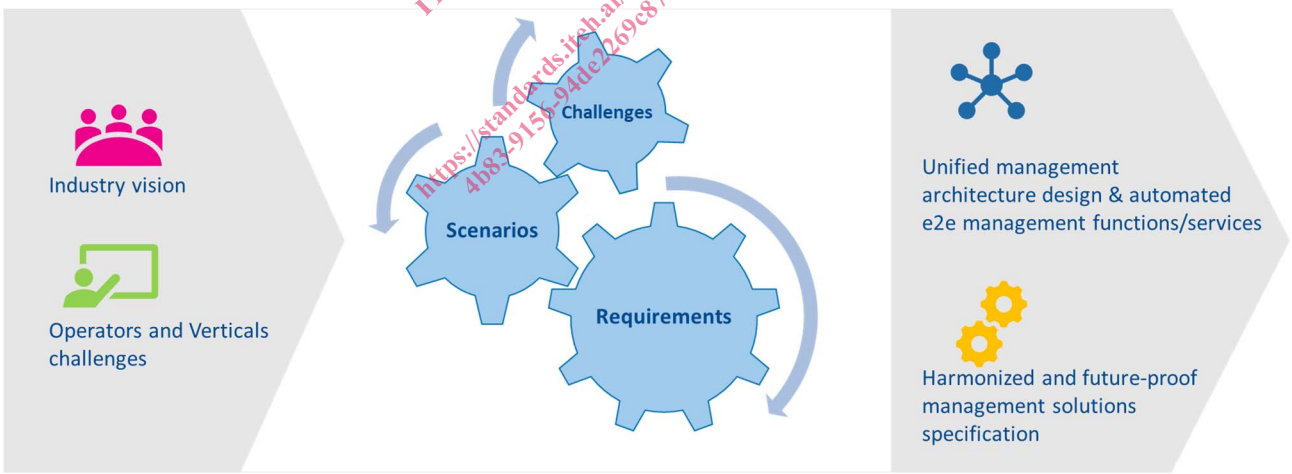

Figure 4-1: From operators and vertical industry problem statements and towards requirements for an E2E automated management architecture and solutions

The scenarios described in the present document identify business-oriented and automation-related challenges faced by operators and vertical industries, and allow deriving architectural, functional, non-functional and operational requirements.

The present document defines 39 scenarios grouped in different categories (and sub-categories) outlining the importance and emphasis of topics such as the management and operation of network slicing in 5G networks, the Network as a Service model, the use and integration of machine learning techniques for network management and operation, collaborative or federated service management, security, testing, tracing, and other important topics like integration and interoperation.

Analysing the scenarios and requirements from another angle allows identifying categories in slightly different dimensions such as:

- Scenarios and requirements related to use cases and which are more technology- or implementation-specific, e.g. network slicing management, edge computing, applied in 5G network, etc.
- Scenarios and requirements that can be considered as building blocks for automatic management for example concerning software management, policy management, bandwidth management, AI techniques, security management, etc.
- Scenarios and requirements that describe ways of implementing E2E automation and zero-touch management, e.g. closed loop automation, coordination between domains, integration of management services, etc.

These different viewpoints can be helpful in case the goal of the reader/stakeholder is to derive priorities among the requirements.

The scenario categories are listed below with short descriptions concerning their contents.

E2E network and service management

The scenarios and requirements that are categorized into this group are related to automating the operational tasks of managing the network. The scope of the ETSI ISG ZSM covers the management of the different technological domains such as Core, RAN and Transport domains, and also includes the management of different types of resources such as VNFs, SDNs, virtual and physical resources, etc., This scenario category focuses on the automation of E2E lifecycle management of all of different types of the network resources and services, including installation, commissioning, configuration, day-2 operations, software upgrades and decommissioning. This category also includes the E2E management solutions for network slicing such as network slice cloning, isolation of network slices to ensure a sufficient level of independency between the network slice instances with tolerable interference, cross-domain network slicing management capability, etc.

Network-as-a-Service (NaaS)

This group focuses on the need for service capabilities exposure from all domains to enable zero touch automation, and to allow for a seamless integration of new products in the network. Network slicing is taken as an example to show what capabilities could be exposed from each domain to allow E2E automation management.

Analytics & machine learning

This group focuses on the scenarios that drive the need for analytics, machine learning and AI capabilities in the ZSM framework. Examples of business requirements that are categorized into this group include the capability to determine the root cause of a network anomaly, and the capability to predict network capacity exhaustion. These requirements drive further functional requirements such as collection of historical data, access to continuous up-to-date network traffic information and ML sandbox environment for self-learning. Analytics and machine learning capabilities are used in the closed-loop automation of the ZSM framework.

Collaborative/federated service management

This group focuses on the business requirements for management and collaboration across multiple operators' domains. An example of requirement includes the advertisement and discovery of the management services from other operators' management domains.

Security

Security, regulatory and privacy requirements for ZSM framework reference architecture are captured in ETSI ZSM 002 [1], and there are a few security-related requirements that are included in other groups such as NaaS and analytics & machine learning. This security group captures additional security-related features such as the handling of decrypting management traffic for troubleshooting purposes.

Testing

Testing group captures the business requirements for features such as automated testing of a managed resource as it is being deployed or testing of an E2E service in the production network. These automated testing features could be incorporated into the closed-loop automation of a resource or service deployment, and in support of finding the root cause of an anomaly. Additionally, requirements related to CI/CD for network services and the automated testing capabilities in connection with AI and machine learning functionalities are also included in this group.

Tracing

Tracing group includes the business requirements for automated tracing that can be triggered by events such as anomaly detection where troubleshooting and root cause analysis need to be performed. Automated tracing capabilities and execution are based on information such as rules, policies, data models, configuration data, etc.

Integration/interoperation

This group focuses on the integration and interoperation between the ZSM framework and other entities such as ZSM framework consumers e.g. user portal, other providers' domains, and human interactions.

5 List of requirements

5.1 Introduction

This clause lists the requirements which are derived from the documented scenarios in clause 6 to the corresponding scenarios are included in the table for each of the requirements. The requirements are assigned to different categories.

For further clarifications and the related detailed context of the requirements, please refer to clause 6.

Some of these requirements are further refined and broken down into multiple functional and non-functional requirements for example in ETSI GS ZSM 002 [1].

5.2 Requirements

Requirements captured from clause 6 are listed in the table 5.2-1.

Table 5.2-1: Requirements based on documented scenarios that are described in clause 6

Req. #	Scenario category	Requirements	Clause of the related scenario	Scenario title
1	6.2.1 E2E automation of 5G network slice as operator-internal management and orchestration	ZSM framework shall support the capability of cloning of network slice instance(s).	6.2.1.1	Network slice lifecycle management
2	6.2.1 E2E automation of 5G network slice as operator-internal management and orchestration	ZSM framework shall support the capability of identifying network functions and resources by analysing the requirements for creating network slice instances.	6.2.1.1	Network slice lifecycle management
3	6.2.1 E2E automation of 5G network slice as operator-internal management and orchestration	ZSM framework shall support the capability of analysing the status of the network resources in the commissioning phase.	6.2.1.1	Network slice lifecycle management