



Zero-touch network and Service Management (ZSM); Cross-domain E2E service lifecycle management

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ETSI GS ZSM 008 V1.1.1 (2022-07)

<https://standards.iteh.ai/catalog/standards/sist/fb4cd72c-617b-4986-a272-1c00b3639d5c/etsi-gs-zsm-008-v1-1-1-2022-07>

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Reference

DGS/ZSM-008ed111_CrossDomE2eS

Keywords

management, network, service

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Contents

Intellectual Property Rights	5
Foreword.....	5
Modal verbs terminology.....	5
1 Scope	6
2 References	6
2.1 Normative references	6
2.2 Informative references.....	8
3 Definition of terms, symbols and abbreviations.....	10
3.1 Terms.....	10
3.2 Symbols.....	10
3.3 Abbreviations	10
4 Overview of cross-domain E2E service lifecycle management	11
5 Cross-domain E2E service lifecycle management processes	14
5.1 Overview	14
5.2 Service onboarding.....	14
5.2.1 Overview	14
5.2.2 Process: Service onboarding.....	14
5.2.2.1 Description	14
5.2.2.2 Procedure flow	15
5.2.2.3 Related management services	17
5.3 Service fulfilment	17
5.3.1 Overview	17
5.3.2 Process: Service instantiation	17
5.3.2.1 Description	17
5.3.2.2 Procedure flow	18
5.3.2.3 Related management services	20
5.3.3 Process: Service activation	21
5.3.3.1 Description	21
5.3.3.2 Procedure flow	22
5.3.3.3 Related management services	23
5.3.4 Process: Service configuration.....	23
5.3.4.1 Description	23
5.3.4.2 Procedure flow	24
5.3.4.3 Related management services	25
5.3.5 Process: Service deactivation.....	25
5.3.5.1 Description	25
5.3.5.2 Procedure flow	26
5.3.5.3 Related management services	27
5.3.6 Process: Service decommissioning.....	27
5.3.6.1 Description	27
5.3.6.2 Procedure flow	28
5.3.6.3 Related management services	29
5.3.7 Process: Update E2E inventory / topology	30
5.3.7.1 Description	30
5.3.7.2 Procedure flow	31
5.3.7.3 Related management services	33
5.4 Service assurance	34
5.4.1 Overview	34
5.4.2 Process: Service assurance set-up.....	34
5.4.2.1 Description	34
5.4.2.2 Procedure flows.....	35
5.4.2.2.1 Producer-initiated set-up of information collection related to domain service instance.....	35
5.4.2.2.2 Consumer-initiated set-up of collecting "E2E-service specific" information related to domain service instances	37

5.4.2.3	Related management services	39
5.4.3	Process: Service quality management.....	39
5.4.3.1	Description	39
5.4.3.2	Procedure flows.....	40
5.4.3.2.1	Main service quality management flow.....	40
5.4.3.2.2	Auxiliary process to collect additional domain performance data.....	43
5.4.3.3	Related management services	46
5.4.4	Process: Service problem management.....	47
5.4.4.1	Description	47
5.4.4.2	Procedure flow	48
5.4.4.3	Related management services	50
5.4.5	Process: Service assurance tear-down.....	51
5.4.5.1	Description	51
5.4.5.2	Procedure flows.....	52
5.4.5.2.1	Producer-initiated tear-down of information collection related to domain service instances	52
5.4.5.2.2	Consumer-initiated tear-down of collecting "E2E-service specific" information related to domain service instances	54
5.4.5.3	Related management services	55
6	Management domain support for cross-domain E2E service lifecycle management.....	56
6.1	Overview	56
6.2	3GPP Core domain and 3GPP RAN domain.....	56
6.3	Fixed access domain.....	63
6.4	Transport domain	67
6.4.1	Overview	67
6.4.2	Optical transport domain with IETF-based NBI.....	67
6.4.3	Optical transport domain with TAPI as NBI	71
6.4.4	Transport domain based on Layer 2 / Layer 3 VPNs.....	79
6.4.5	Transport slices	83
6.5	Cloud domain	87
7	Gaps and commonalities	91
Annex A (normative):	Management services.....	95
A.1	Overview	95
A.2	Additional services	95
A.2.1	E2E services topology management service.....	95
A.3	Additional service capabilities	95
A.3.1	Domain inventory information service.....	95
A.3.2	Domain topology information service	96
A.3.3	Managed services catalogue management service	96
Annex B (informative):	Further northbound interfaces.....	97
B.1	Domain northbound interfaces specified by TMF Open API.....	97
Annex C (informative):	Change History	100
History		105

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Modal verbs terminology

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1 Scope

The present document investigates the management of End to End (E2E) services across Management Domains (MDs).

It defines the management processes during the lifecycle of E2E services (covering onboarding processes, fulfilment processes and assurance processes) and describes the interactions between E2E service management domain and management domains during these processes.

Furthermore, it maps the management services used in the management processes to the northbound interfaces of selected technology domains and references the underlying specifications of these interfaces. These mappings enable the automation of lifecycle management across domains.

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.

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

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- [2] ETSI GS ZSM 007: "Zero-touch network and Service Management (ZSM); Terminology for concepts in ZSM".
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[49] IETF RFC 9182: "A YANG Network Data Model for Layer 3 VPNs".

2.2 Informative references

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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.

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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:

domain service: service that is managed by a management domain

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:

5G	5 th Generation
API	Application Programming Interface
BBF	Broadband Forum
CCAMP	Common Control and Measurement Plane
CCO	Cloud Central Office
CCO DO	Cloud Central Office Domain Orchestrator
CloudCO	Cloud Central Office
CRUD	Create, Read, Update, Delete
CRUD-N	CRUD plus Notify
E2E	End-to-End
E-UTRAN	Evolved Universal Mobile Telecommunications System Terrestrial Radio Access Network
EPC	Evolved Packet Core
ETSI	European Telecommunications Standards Institute
FM	Fault Management
gNMI	gRPC Network Management Interface
gRPC	Google Remote Procedure Call
IETF	Internet Engineering Task Force
IFA	InterFaces and Architecture
IOC	Information Object Class
KPI	Key Performance Indicator
L2	Layer 2
L2NM	Layer 2 Network Model
L2SM	Layer 2 Service Model
L2VPN	Layer 2 VPN
L3	Layer 3
L3NM	Layer 3 Network Model
L3SM	Layer 3 Service Model
L3VPN	Layer 3 VPN
LCM	LifeCycle Management
LTE	Long-Term Evolution
MD	Management Domain
MDA	Management Data Analytics
MDAS	Management Data Analytics Service
MnF	Management Function
MnS	Management Service
MOI	Managed Object Instance

n/a	not applicable
NBI	NorthBound Interface
NFV	Network Functions Virtualisation
NFVO	NFV Orchestrator
NRM	Network Resource Model
NSC	Network Slice Controller
NWDAF	Network Data Analytics Function
ONF	Open Networking Foundation
OTN	Optical Transport Network
PM	Performance Management
SDK	Software Development Kit
SOL	SOLutions
TAPI	Transport Application Programming Interfaces
TEAS	Traffic Engineering Architecture and Signaling
TMF	TM Forum
TR	Technical Report
UC	Use Case
VNF	Virtualised Network Function
VPN	Virtual Private Network
WG	Working group
XML	eXtensible Markup Language
YANG	Yet Another Next Generation

4 Overview of cross-domain E2E service lifecycle management

The E2E service lifecycle is managed using different processes.

Roughly, the processes can be divided into:

- *onboarding processes* that ingest a service model that was created during an out-of-scope service design phase into the ZSM framework;
- *fulfilment processes* that bring up a service instance based on an onboarded service model, configure the service instance, activate it for use and finally terminate it;
- *assurance processes* that ensure a service is free of faults (service problem management) and meets its SLs (service quality management).

Onboarding and fulfilment processes are typically finite and are executed per request. Assurance processes typically execute continuously once set up, ideally in closed loops. ETSI GS ZSM 009-1 [i.1] defines enablers for closed loops.

The present document focuses on the cross-domain aspects of these management processes and what management services can be used to implement those processes.

Figure 4-1 illustrates the management processes during the E2E service lifecycle. Furthermore, the figure indicates as example the groups of management services introduced in ETSI GS ZSM 002 [1] that can be used to implement the processes. Apart from the processes that start the lifecycle of a service instance (service instantiation and assurance set-up) and end it (service decommissioning and assurance tear-down), the figure depicts sets of processes with no particular order. The processes are further detailed in clause 5.

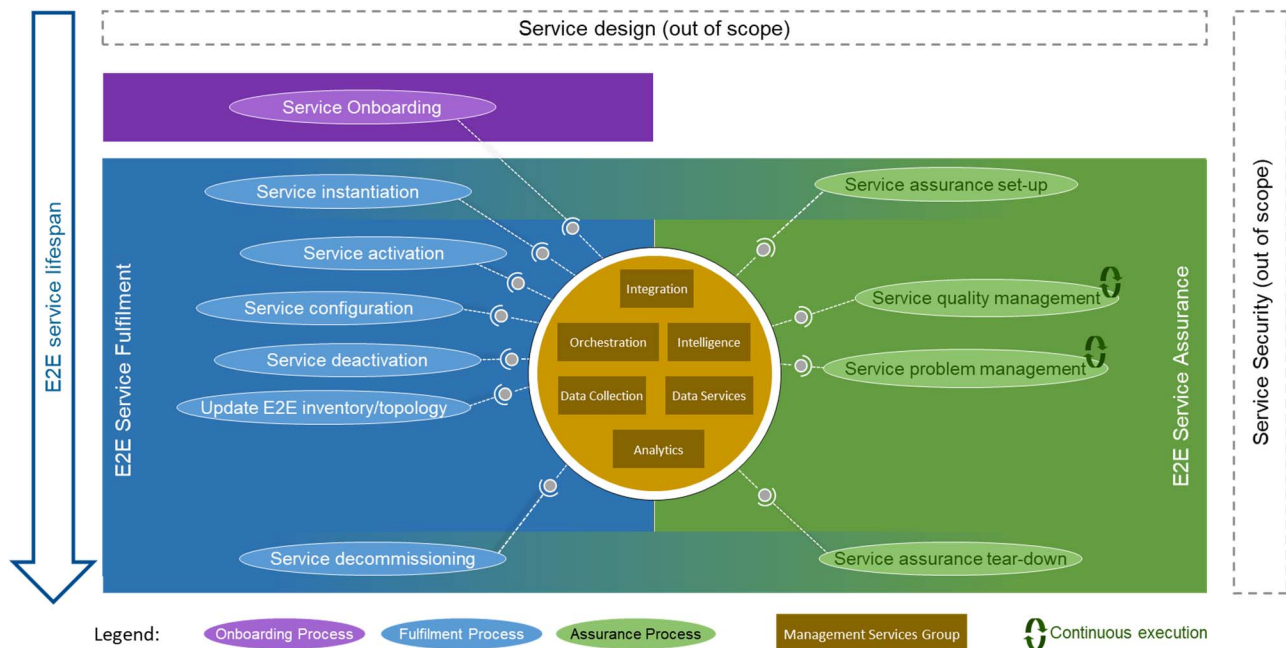


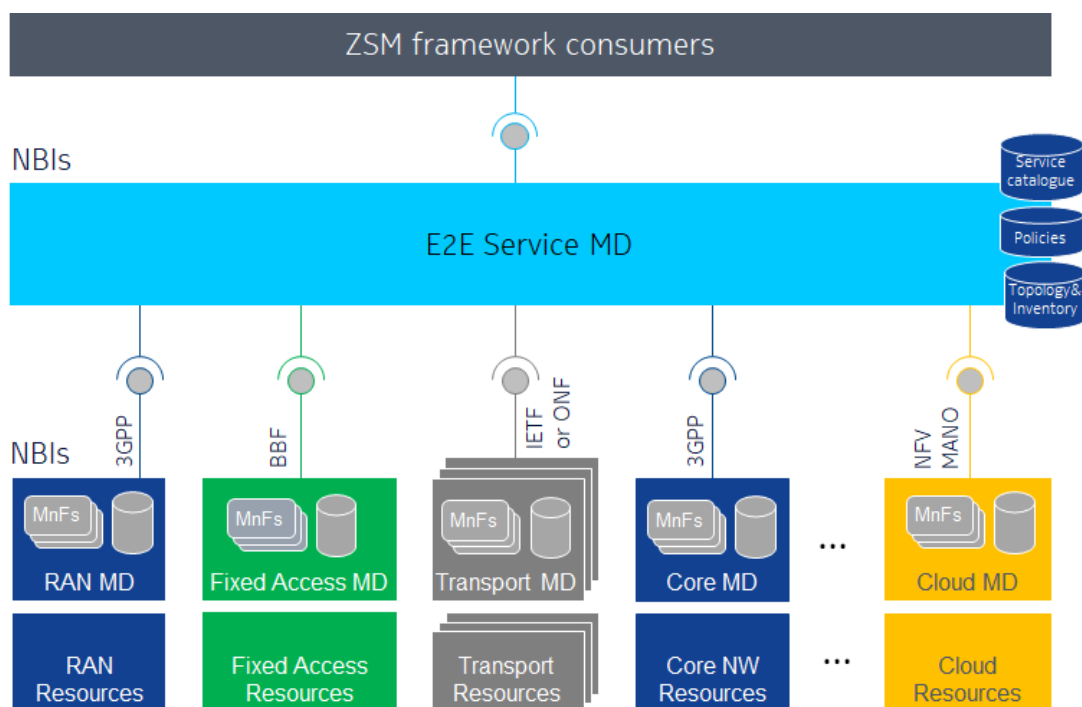
Figure 4-1: Management processes during the lifecycle of E2E services

Each management process during the E2E service lifecycle requires that the E2E service management domain consumes management services from the management domains. For example, a fulfilment process might use Orchestration services for service configuration, and Data Collection services to validate if the service quality requirements are met initially. As another example, an assurance process might be realized as a closed loop using Data Collection services, Data Analytics Services, Intelligence services together with Orchestration services to improve the configuration in order to maintain the desired service quality.

A large set of these management services depends on the technology used in the underlying management domain. The E2E service management domain needs to be able to consume the various management services from the management domains via the endpoints that make up the northbound interface of the domain.

Figure 4-2 illustrates the set of technology domains considered in the present document. In deployments, there may be additional technology domains. Clause 6 documents the northbound interfaces of management domains based on different technologies.

In the present document, the NBIs of the E2E service management domain are defined in terms of ZSM management services (see ETSI GS ZSM 002 [1] with extensions defined in Annex A of the present document). The technology mapping of these NBIs is out of scope of the present document.



NOTE 1: NBIs depicted in figure 4-2 are neither mandatory nor exhaustive ones, but examples to be utilized.

NOTE 2: The cross-domain integration fabric is not depicted in figure 4-2 for simplicity.

Figure 4-2: Domain NBIs consumed during the management of the lifecycle of E2E services

Clause 7 documents gaps and commonalities between the different technology domains with respect to their northbound interfaces.

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5 Cross-domain E2E service lifecycle management processes

5.1 Overview

Clause 5 introduces typical lifecycle management processes that the E2E service management domain performs to manage E2E services throughout their lifespan and during which it interacts with the underlying management domains that manage resources and domain services which are needed for the E2E service.

In deployments, processes may be combined or split.

For each process, a description, a process flow and a list of related management services are provided. The description explains the overall purpose and task of the process. The procedure flow provides a graphical and a textual representation of the individual steps of the process. For simplicity's sake, only requests are shown in the flows and responses and acknowledgements are omitted. Furthermore, for the unsuccessful execution of the procedures, only error conditions are defined, but no detailed error flows are specified. The list of related management services includes management services that are produced or consumed by the E2E service management domain and therefore represent a cross-domain integration point. Management services that are invoked internally by the management domain or E2E service management domain (i.e. where producer and consumer are in the same domain) are not listed as these do not require cross-domain integration or coordination.

In the following, the term "domain service" is used as shorthand for "a service that is managed by a management domain".

The processes are split into three categories: Service onboarding, Service fulfilment and Service assurance, as depicted in figure 4-1.

5.2 Service onboarding

5.2.1 Overview

The following sub-clauses introduce typical onboarding processes, i.e. processes that the E2E service management domain performs to obtain E2E service models from service design (which is out of scope of the present document) and that prepare the E2E service management domain and the management domains for the instantiation of such services.

5.2.2 Process: Service onboarding

5.2.2.1 Description

The "Service onboarding" process imports a new service model into the service catalogue of the E2E service management domain, following the service design phase that is outside the scope of the present document. The E2E service model is introduced in clause 6.6.5.2.3 of ETSI GS ZSM 002 [1].

Onboarding may optionally include the importing of a service template that allows to parameterize the service model when a subsequent service instance creation is requested. A service template contains a customer-facing part and a resource-facing part. The customer facing part, called the service offer descriptor, defines a set of parameters with their allowed values or value ranges which can be used by the ZSM framework consumers to configure the characteristics of the service they request to instantiate. The resource-facing part defines how to map the parameters in the service offer descriptor to the realization of the service.

5.2.2.2 Procedure flow

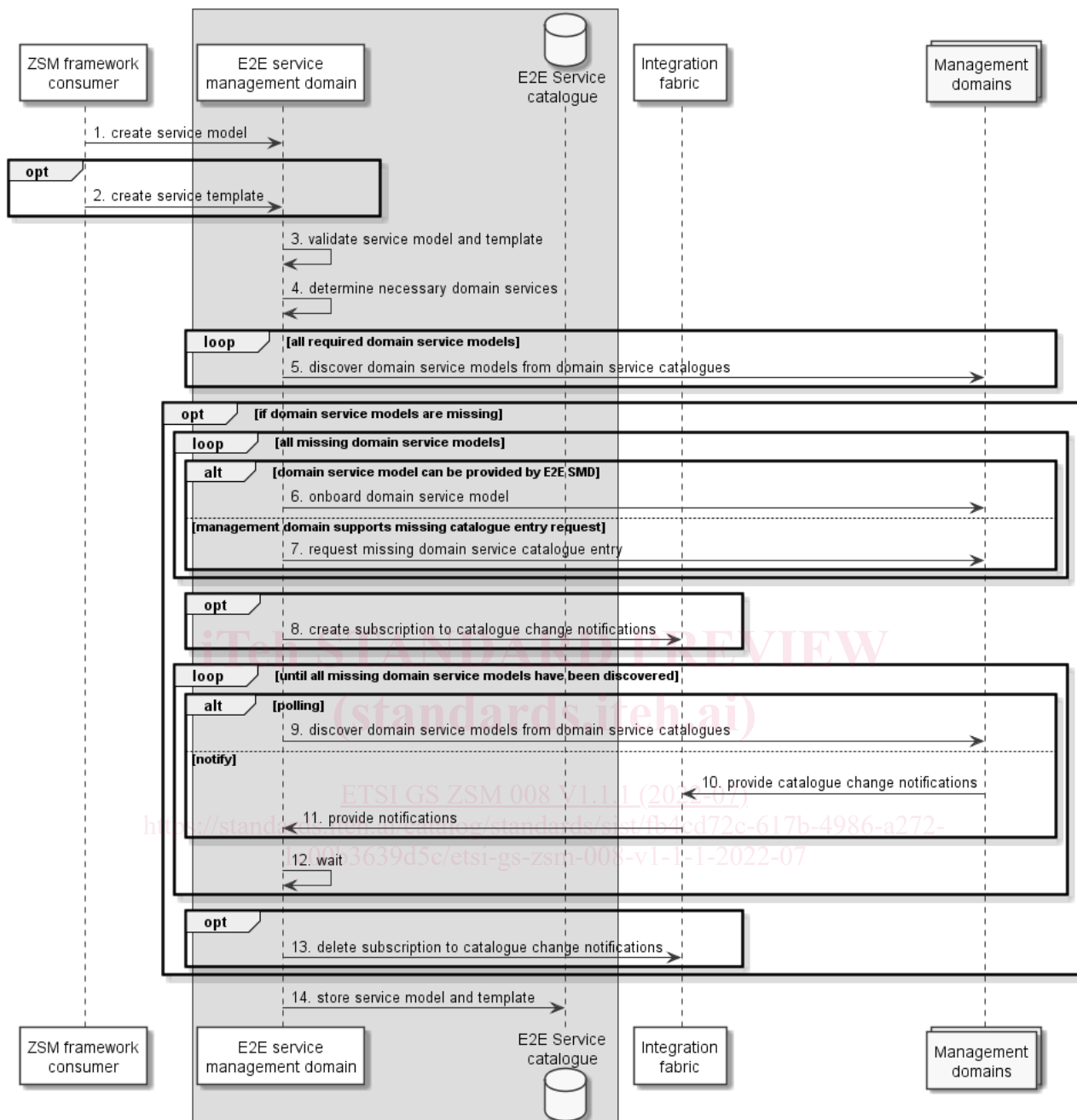


Figure 5.2.2.2-1: Service onboarding

PRECONDITIONS:

- None.

The procedure, as illustrated in figure 5.2.2.2-1, consists of the following steps:

1. The ZSM framework consumer requests the creation of a service model and its import into the service catalogue managed by the E2E service management domain by consuming the "Manage service models" capability of the "Managed services catalogue management service".
2. Optionally, the ZSM framework consumer also requests the creation of a related service template and its import into the service catalogue, consuming the same service.