

ETSI EN 300 392-3-1 V1.4.1 (2015-12)



**Terrestrial Trunked Radio (TETRA);
Voice plus Data (V+D);
Part 3: Interworking at the Inter-System Interface (ISI);
Sub-part 1: General design**

*iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standards documents are available at:
<https://standards.iteh.ai/catalog/standards/sis/4216283-42a1-4da3-b64f-0018d9113b61/etsi-en-300-392-3-1-v1-4-1-2015-12>*

Reference

REN/TCCE-03236

Keywords

interworking, radio, TETRA, V+D

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 only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

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

<http://portal.etsi.org/tb/status/status.asp>

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

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2015.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	5
Foreword.....	5
Modal verbs terminology.....	6
1 Scope	7
2 References	7
2.1 Normative references	7
2.2 Informative references.....	8
3 Definitions and abbreviations.....	9
3.1 Definitions.....	9
3.2 Abbreviations	10
4 ISI standardization methodology.....	11
4.1 3 stage methodology.....	11
4.1.0 General.....	11
4.1.1 Stage 1 description.....	11
4.1.2 Stage 2 description.....	12
4.1.3 Stage 3 description.....	12
4.2 Usage of Specification and Description Language (SDL).....	12
5 Usage of Private Signalling System 1 (PSS1) for TETRA	13
5.1 PSS1 functionality.....	13
5.2 Protocol stack for signalling information	13
5.3 Generic Functional Protocol (GFP).....	14
5.4 Protocol stack for user information	15
6 TETRA SwMI roles using ISI.....	15
6.1 Management configurations	15
6.1.1 Migration and group attachment configurations	15
6.1.1.1 SwMI roles for migration and group attachment	15
6.1.1.2 SwMI databases	16
6.1.1.3 Migration scenarios.....	17
6.1.1.4 Group attachment scenarios	18
6.1.2 Group linking configurations.....	18
6.2 Call configurations	20
6.2.0 General.....	20
6.2.1 Group call configuration.....	20
6.2.2 Individual call configuration.....	22
6.2.3 Transit.....	23
6.3 User information encoding at the ISI	23
7 Introduction to ISI ANFs.....	23
7.0 General	23
7.1 ANF-ISIMM.....	24
7.2 ANF-ISIIC.....	24
7.3 ANF-ISIGC	24
7.4 ANF-ISISDS	24
7.5 ANF-ISISS	24
8 ISI Generic Functional Protocol (ISI GFP)	24
8.1 Protocol model	24
8.2 Services provided by the protocol model entities.....	25
8.3 Addressing and transport.....	26
8.3.1 Addressing	26
8.3.2 Transport of ROSE APDUs.....	27
8.3.2.0 General	27
8.3.2.1 Call related ROSE APDUs.....	27
8.3.2.2 Call unrelated ROSE APDUs.....	27

8.3.2.2.0	General	27
8.3.2.2.1	Protocol for the establishment of a call independent signalling connection	27
8.3.2.2.2	Use of a call independent signalling connection already established	28
8.3.2.2.3	Clearing of a call independent signalling connection	28
8.4	Remote Operations Service Entity (ROSE) requirements and operation definition	29
8.4.1	General	29
8.4.2	Return-result	32
8.4.3	Return-error	32
8.4.4	Reject	33
8.5	Segmentation Service Element (SSE)	33
8.5.0	Overview	33
8.5.1	Procedures	34
8.5.1.0	General	34
8.5.1.1	Requirements for the segmentation procedure	34
8.5.1.2	Requirements for the re-assembly procedure	34
8.5.2	Segment encoding	35
8.6	Co-ordination Function	36
9	Security over the ISI	36
9.0	General	36
9.1	ITSI authentication	37
9.2	End-to-end encryption	37
9.3	End-to-end key management via ISI	37
Annex A (normative):	Security - supporting encryption over ISI	38
A.1	Overview	38
A.2	Encryption	39
A.2.1	ISI relation to air interface and end-to-end encryption	39
A.2.2	Air interface encryption key management via ISI	39
A.2.2.0	General	39
A.2.2.1	Secret Key of individual subscriber (K)	40
A.2.2.2	Derived Cipher Key (DCK)	40
A.2.2.3	Common Cipher Key (CCK)	40
A.2.2.4	Static Cipher Key (SCK)	40
A.2.2.5	Group Cipher Key (GCK)	40
Annex B (informative):	Maximum length of a ROSE APDU or a SSE segment encoded in a facility information element	41
B.0	General	41
B.1	PSS1 FACILITY message	41
B.2	PSS1 basic call message	42
B.3	Example of the encoding of an ANF-ISIMM MIGRATION PDU in a ROSE Invoke ROSE APDU in a call PISN FACILITY PDU	43
Annex C (informative):	Change requests	45
History		46

Intellectual Property Rights

IPRs essential or potentially essential to the present document 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 (<http://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.

Foreword

This European Standard (EN) has been produced by ETSI Technical Committee TETRA and Critical Communications Evolution (TCCE).

The present document is part 3, sub-part 1 of a multi-part deliverable covering the Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D), Release 2 as identified below:

ETSI EN 300 392-1: "General network design";

ETSI EN 300 392-2: "Air Interface (AI)";

ETSI EN 300 392-3: "Interworking at the Inter-System Interface (ISI)";

ETSI EN 300 392-3-1: "General design";

ETSI EN 300 392-3-2: "Additional Network Feature Individual Call (ANF-ISIIC)";

ETSI EN 300 392-3-3: "Additional Network Feature Group Call (ANF-ISIGC)";

ETSI EN 300 392-3-4: "Additional Network Feature Short Data Service (ANF-ISISDS)";

ETSI EN 300 392-3-5: "Additional Network Feature for Mobility Management (ANF-ISIMM)";

ETSI TS 100 392-3-6: "Speech format implementation for circuit mode transmission";

ETSI TS 100 392-3-7: "Speech Format Implementation for Packet Mode Transmission";

ETSI TS 100 392-3-8: "Generic Speech Format Implementation";

ETSI ETS 300 392-4: "Gateways basic operation";

ETSI EN 300 392-5: "Peripheral Equipment Interface (PEI)";

ETSI EN 300 392-7: "Security";

ETSI EN 300 392-9: "General requirements for supplementary services";

ETSI EN 300 392-10: "Supplementary services stage 1";

ETSI EN 300 392-11: "Supplementary services stage 2";

ETSI EN 300 392-12: "Supplementary services stage 3";

ETSI ETS 300 392-13: "SDL model of the Air Interface (AI)";

ETSI ETS 300 392-14: "Protocol Implementation Conformance Statement (PICS) proforma specification";

ETSI TS 100 392-15: "TETRA frequency bands, duplex spacings and channel numbering";

ETSI TS 100 392-16: "Network Performance Metrics";

ETSI TR 100 392-17: "TETRA V+D and DMO specifications";

ETSI TS 100 392-18: "Air interface optimized applications".

NOTE 1: Part 3, sub-parts 6 and 7 (Speech format implementation), part 4, sub-part 3 (Data networks gateway), part 10, sub-part 15 (Transfer of control), part 13 (SDL) and part 14 (PICS) of this multi-part deliverable are in status "historical" and are not maintained.

NOTE 2: Some parts are also published as Technical Specifications such as TS 100 392-2 and those may be the latest version of the document.

National transposition dates	
Date of adoption of this EN:	7 December 2015
Date of latest announcement of this EN (doa):	31 March 2016
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 September 2016
Date of withdrawal of any conflicting National Standard (dow):	30 September 2016

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 the general aspects of interworking at the Inter-System Interface (ISI) for Terrestrial Trunked Radio (TETRA) system supporting Voice plus Data (V+D). Those specify the general concepts which are the basis of the ISI operation between TETRA systems. It introduces the Additional Network Features (ANFs) used at the ISI, and specifies:

- the general protocol mechanism, called ISI Generic Functional Protocol (ISI GFP), upon which the definition of each ANF is based; and
- the security requirements for the ISI.

The ISI GFP specification applies to any TETRA Switching and Management Infrastructure (SwMI) which supports the ISI. The security requirements for the ISI only apply to SwMIs which support authentication or encryption over the ISI.

Besides the ISI general design, the present document, interworking at the Inter-System Interface comprises the following other sub-parts:

- Additional Network Feature - ISI Individual Call (ANF-ISIIC);
- Additional Network Feature - ISI Group Call (ANF-ISIGC);
- Additional Network Feature - ISI Short Data service (ANF-ISISDS); and
- Additional Network Feature - ISI Mobility Management (ANF-ISIMM).

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 reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://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 EN 300 392-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".
- [2] ETSI EN 300 392-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".
- [3] ETSI EN 300 392-3-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 2: Additional Network Feature Individual Call (ANF-ISIIC)".
- [4] ETSI EN 300 392-3-3: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 3: Additional Network Feature Group Call (ANF-ISIGC)".
- [5] ETSI EN 300 392-3-4: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 4: Additional Network Feature Short Data Service (ANF-ISISDS)".
- [6] ETSI EN 300 392-3-5: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 5: Additional Network Feature for Mobility Management (ANF-ISIMM)".

- [7] ETSI TS 100 392-3-8: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 8: Generic Speech Format Implementation".
- [8] ETSI EN 300 392-7: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 7: Security".
- [9] ETSI EN 300 392-9: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 9: General requirements for supplementary services".
- [10] ETSI ETS 300 402-1: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Data link layer; Part 1: General aspects [ITU-T Recommendation Q.920 (1993), modified]".
- [11] ETSI ETS 300 402-2: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Data link layer; Part 2: General protocol specification [ITU-T Recommendation Q.921 (1993), modified]".
- [12] ISO/IEC 11572: "Information technology -- Telecommunications and information exchange between systems -- Private Integrated Services Network -- Circuit mode bearer services -- Inter-exchange signalling procedures and protocol".
- [13] ISO/IEC 11582: "Information technology -- Telecommunications and information exchange between systems -- Private Integrated Services Network -- Generic functional protocol for the support of supplementary services -- Inter-exchange signalling procedures and protocol".
- [14] Recommendation ITU-T G.704: "Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels".
- [15] Recommendation ITU-T Q.931: "ISDN user-network interface layer 3 specification for basic call control".
- [16] Recommendation ITU-T X.690: "Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)".
- [17] Recommendation ITU-T X.219: "Remote Operations: Model, notation and service definition".
- [18] Recommendation ITU-T X.882: "Information technology - Remote Operations: OSI realizations - Remote Operations Service Element (ROSE) protocol specification Remote Operations: Protocol specification".

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 reference 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 EN 300 395-1: "Terrestrial Trunked Radio (TETRA); Speech CODEC for full-rate traffic channel; Part 1: General description of speech functions".
- [i.2] Recommendation ITU-T I.130: "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [i.3] Recommendation ITU-T Z.100: "Specification and description language (SDL)".
- [i.4] Recommendation ITU-T E.164: "The international public telecommunication numbering plan".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ISO/IEC 11582 [13] and the following apply:

call independent: property of information which is conveyed across the Q reference point in a message that does not use a call reference which has an associated user-information connection

NOTE: In TETRA standards, the term call unrelated is used with the same meaning as call independent.

call independent signalling connection: signalling connection established between ANF-ISI entities located in different Switching and Management Infrastructures that does not have an associated user-information connection

call unrelated: See the definition of the term "call independent".

co-ordination Function: entity which provides co-ordination between different ANF-ISI entities, ROSE, SSE and GFT Control for different TETRA basic and supplementary services

destination SwMI: Switching and Management Infrastructure where the receiving ANF-ISI entity is located (in the context of a single one-way exchange of information between two ANF-ISI entities located in different Switching and Management Infrastructures)

Generic Functional Transport Control (GFT Control) entity: entity that exists within a Switching and Management Infrastructure and provides a range of services to the ANF-ISI entities and ROSE via the co-ordination Function

NOTE: The services are defined in clause 6 of ISO/IEC 11582 [13].

group attached SwMI: Switching and Management Infrastructure different from the home SwMI of the group considered in which at least one individual subscriber member of the group is attached to that group

Group TETRA Subscriber Identity (GTSI): TETRA Subscriber Identity assigned to a group

home SwMI: Switching and Management Infrastructure in which the subscription of a given user is registered

NOTE: That user is defined as being a subscriber (see below the definition of that term).

invocation: action taken by the user or by the service provider to execute a specific service function within real time

Location Area (LA): area within radio coverage of a base station or group of base stations within which a Mobile Station (MS) is allowed to operate

Mobile Network Identity (MNI): identity that is broadcast by all TETRA base stations to uniquely identify the SwMI

NOTE: It consists of the Mobile Country Code (MCC) and the Mobile Network Code (MNC).

Mobile Station (MS): physical grouping that contains all of the mobile equipment that is used to obtain TETRA services

NOTE: By definition, a mobile station contains at least one Mobile Radio Stack (MRS).

originating SwMI: in the context of a TETRA call, Switching and Management Infrastructure where the calling user is registered (which implies that this user is located in that SwMI) or Switching and Management Infrastructure which originates a Call independent signalling connection

segmentation: act of generating two or more PDUs derived from an initial one

service user: abstract representation of the totality of those entities in a single system that makes use of a service through a single access point

Short Subscriber Identity (SSI): network specific portion of a TSI

NOTE: A SSI is only unique within one TETRA sub-domain (one TETRA network).

source SwMI: Switching and Management Infrastructure where the sending ANF-ISI entity is located (in the context of a single one-way exchange of information between two ANF-ISI entities located in different Switching and Management Infrastructures)

subscriber: user of a telecommunication service, based on a contract with the provider of the service

NOTE 1: The subscriber may be an individual or a group: in the first case it is identified by an ITSI, in the second, by a GTSI.

NOTE 2: The individual subscriber is able to access an SwMI either through a MS or Line Station.

supplementary service: modifies or supplements a basic bearer service or a basic teleservice

NOTE: A supplementary service cannot be offered to a customer as a stand-alone service. It should be offered in combination with a bearer service or a teleservice.

Switching and Management Infrastructure (SwMI): all of the TETRA equipment for a Voice plus Data (V+D) network

NOTE: The SwMI enables users to communicate with each other.

terminating SwMI: in the context of a TETRA call, Switching and Management Infrastructure where the calling user is registered (which implies that this user is located in that SwMI) or Switching and Management Infrastructure which terminates a Call independent signalling connection

TETRA Subscriber Identity (TSI): global TETRA network address that is to identify an individual or a group subscriber within the domain of all TETRA networks

user: entity using the services of a telecommunications network via an externally accessible service access point

NOTE: An individual user may be a person or an application process.

visited SwMI: Switching and Management Infrastructure different from the home SwMI in which a given subscriber is currently registered

NOTE: The definition of this term implies that the given subscriber is mobile and has moved away from his home SwMI (to register in this visited SwMI). Therefore, it cannot apply to a group.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

(V)ASSI	Visiting Alias Short Subscriber Identity
(V)GSSI	Visiting Group Short Subscriber Identity
AC	Authentication Centre
ANF	Additional Network Feature
ANF-ISI	Additional Network Features of the Inter-System Interface
APDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation One
BER	Basic Encoding Rules
BS	Base Station
C	Conditional
CAD	Call Authorized by Dispatcher
CCK	Common Cipher Key
CF	Call Forwarding
C-LDB	Controlling Linking DataBase
DCK	Derived Cipher Key
E.1	E-carrier signal level 1, 2 048 kbit/s
ECMA	European Computer Manufacturers Association
GCK	Group Cipher Key
GFP	Generic Functional Protocol
GFT	Generic Functional Transport
G-HDB	Group Home DataBase
GTSI	Group TETRA Subscriber Identity
G-VDB	Group Visited DataBase

HAC	Home Authentication Centre
HDB	Home DataBase
HDLC	High-level Data Link Control
I-HDB	Individual Home DataBase
ISI	Inter-System Interface
ISSI	Individual Short Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
I-VDB	Individual Visited DataBase
K	authentication Key
KS	Session Key
LA	Location Area
LAPD	Link Access Procedure for the D-Channel
LS	Line Station
M	Mandatory
MCC	Mobile Country Code
MM	Mobility Management
MNC	Mobile Network Code
MNI	Mobile Network Identity
MRS	Mobile Radio Stack
MS	Mobile Station
MSISDN	Mobile Station ISDN number
NFE	Network Facility Extension
O	Optional
OTAR	Over The Air Re-keying
PC	Protocol Control
PDU	Protocol Data Unit
PINX	Private Integrated Network eXchange
PISN	Private Integrated Services Network
PN	Party Number
PSS1	Private Signalling System 1
PSTN	Public Switched Telephone Network
QSIG	Q interface SIGnalling protocol
ROSE	Remote Operation Service Element
RS	Random Seed
SCK	Static Cipher Key
SDL	Specification and Description Language
SDS	Short Data Service
SS	Supplementary Services
SSE	Segmentation Service Element
SSI	Short Subscriber Identity
SwMI	TETRA Switching and Management Infrastructure
TSI	TETRA Subscriber Identity
V+D	Voice plus Data
VAC	Visitor Authentication Centre
VDB	Visitor DataBase

4 ISI standardization methodology

4.1 3 stage methodology

4.1.0 General

The ISI Additional Network Features (ANFs), listed in clause 7, are standardized using the modelling method defined in Recommendation ITU-T I.130 [i.2].

4.1.1 Stage 1 description

Stage 1 description defines the services which the standardized ANF entity provides to the concerned service users, e.g. SwMI entities in the case of TETRA. The services are visible at the Service Access Points (SAPs). The stage 1 description is intended to allow an understanding of the services independently from the implementation.

For normal point-to-point services the service model is shown in figure 1.

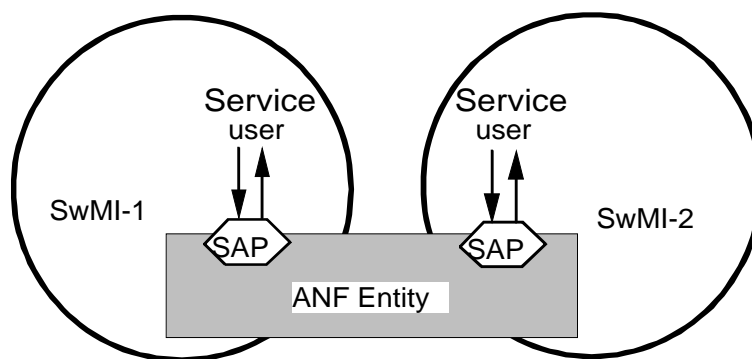


Figure 1: Service model for point-to-point services

For point-to-multipoint services the service model is shown in figure 2.

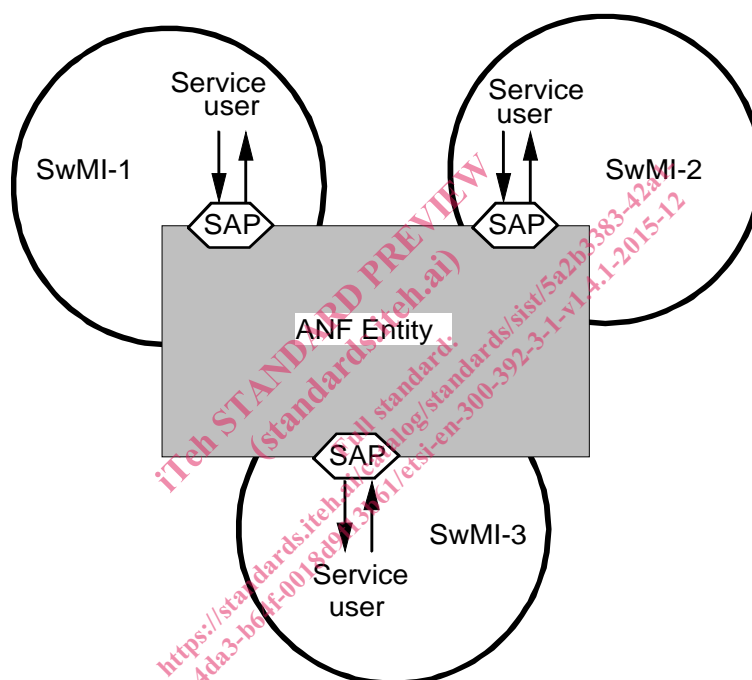


Figure 2: Service model for point-to-multipoint services

4.1.2 Stage 2 description

Stage 2 description identifies the functional capabilities and the information flows needed to support the service as described in stage 1.

4.1.3 Stage 3 description

Stage 3 description gives a precise specification of the signalling protocols for the ANF services, i.e. the encoding rules for the information flows and the corresponding procedures.

4.2 Usage of Specification and Description Language (SDL)

SDL defined in Recommendation ITU-T Z.100 [i.3] is used to identify and represent the behaviour of the concerned ANF in providing services.