



TECHNICAL REPORT

**Digital cellular telecommunications system (Phase 2+);  
Universal Mobile Telecommunications System (UMTS);  
LTE;  
Network composition feasibility study  
(3GPP TR 22.980 version 13.0.0 Release 13)**



---

Reference

RTR/TSGS-0122980vd00

---

Keywords

GSM,LTE,UMTS

**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/CommitteeSupportStaff.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 2016.  
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.

---

## 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 (<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.

---

## Foreword

This Technical Report (TR) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

---

## 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.

# Contents

Intellectual Property Rights .....	2
Foreword.....	2
Modal verbs terminology.....	2
Foreword.....	6
Introduction .....	6
1 Scope .....	7
2 References .....	7
3 Definitions, symbols and abbreviations .....	8
3.1 Definitions.....	8
3.2 Symbols.....	9
3.3 Abbreviations .....	9
4 Principles, Purpose and Benefits of Network Composition .....	10
4.1 Principles.....	10
4.1.1 General.....	10
4.1.2 Types of Network Composition.....	10
4.1.2 Other common styles.....	12
4.2 Purpose and Benefits.....	12
4.3 Management aspects.....	13
4.4 Resource control, resource usage and resource access provisioning.....	13
4.5 Multi-lateral Compositions.....	14
4.5.1 General.....	14
4.5.2 A set of bi-lateral Cas .....	15
4.5.3 A multi-lateral CA .....	16
4.5.4 Advantages and disadvantages of different approaches to support multi-lateral compositions .....	17
5 Composition Use Cases.....	18
5.1 Description .....	18
5.2 Network Composition between Core Networks .....	18
5.2.1 General.....	18
5.2.2 Inter-operator Network Composition (via GRX).....	18
5.2.2.1 Short Description .....	18
5.2.2.2 Actor Specific Issues and Benefits.....	19
5.2.2.3 Pre-Conditions .....	19
5.2.2.4 Normal Flow .....	20
5.2.2.5 Alternative Flow .....	20
5.2.2.6 Additional Information.....	20
5.2.3 On-demand inter-operator Network Composition .....	21
5.2.3.1 Short Description .....	21
5.2.3.2 Actor Specific Issues and Benefits.....	21
5.2.3.3 Pre-Conditions .....	22
5.2.3.4 Normal Flow .....	22
5.2.3.5 Alternative Flow .....	22
5.2.3.6 Additional Information.....	23
5.3 Network Composition between Core Network and Access Network.....	23
5.3.1 Composition of a nomadic I-WLAN with a 3GPP network .....	23
5.3.1.1 Short Description .....	23
5.3.1.2 Actor Specific Issues and Benefits.....	23
5.3.1.3 Pre-Conditions .....	24
5.3.1.4 Normal Flow .....	24
5.3.1.5 Alternative Flows .....	24
5.3.1.6 Additional Information.....	24
5.3.2 Scenario Extensions for I-WLAN / 3GPP network composition.....	25

5.3.2.1	Short Description .....	25
5.3.2.2	Actor Specific Issues and Benefits .....	25
5.3.2.3	Pre-Conditions .....	26
5.3.2.4	Normal Flow .....	26
5.3.2.5	Alternative Flow .....	26
5.3.2.6	Additional information .....	26
5.3.3	Network Composition of a moving network with 3GPP networks .....	26
5.3.3.1	Short Description .....	26
5.3.3.2	Actor Specific Issues and Benefits .....	27
5.3.3.3	Pre-Conditions .....	28
5.3.3.4	Normal Flow .....	28
5.3.3.5	Alternative Flow .....	28
5.3.3.6	Additional Information .....	28
5.3.4	Access Networks – Core/service/identity provider networks: Network Composition of different types of access networks with core networks providing different types of end user services .....	28
5.3.4.1	Scenario overview .....	28
5.3.4.2	Scenario technical description .....	29
5.3.4.3	Operator / user role .....	29
5.3.4.4	Composition Type .....	29
5.3.4.5	Framework Agreement and Composition Agreement .....	29
5.3.4.6	Scenario Benefits .....	29
5.4	Network Composition between Access Networks .....	30
5.5	Network Composition between Core Network and PAN/PN/UE .....	30
5.6	Network Composition between Access Network and PAN/PN/UE .....	31
5.6.1	Network Composition of individual users with access networks in public spaces .....	31
5.6.1.1	Short Description .....	31
5.6.1.2	Actor Specific Issues and Benefits .....	31
5.6.1.3	Pre-Conditions .....	32
5.6.1.4	Normal Flow .....	32
5.6.1.5	Alternative Flow .....	32
5.6.1.6	Additional Information .....	32
5.7	Network Composition between PNs .....	32
5.7.1	Short Description .....	32
5.7.2	Actor Specific Issues and Benefits .....	33
5.7.3	Pre-Conditions .....	33
5.7.4	Normal Flow .....	33
5.7.5	Alternative Flow .....	35
5.7.6	Additional Information .....	35
5.8	3GPP network operators forming a roaming consortium: .....	36
5.9	Decomposition between Core Network and Access Network .....	37
5.9.1	Decomposition between a nomadic I-WLAN and a 3GPP network .....	37
5.9.1.1	Short Description .....	37
5.9.1.2	Actor Specific Issues and Benefits .....	37
5.9.1.3	Pre-Conditions .....	38
5.9.1.4	Normal Flow .....	38
5.9.1.5	Alternative Flows .....	38
5.9.1.6	Additional Information .....	38
6	Description of Composition Process .....	38
6.1	Composition process .....	38
6.1.1	Media Sense .....	39
6.1.2	Discovery / Advertisement .....	39
6.1.3	Establishment of Security and Internetworking Connectivity .....	39
6.1.4	Composition Agreement Negotiation .....	40
6.1.5	Composition Agreement Realization .....	40
6.1.6	Maintaining a composed Composition Capable Network .....	40
6.2	Decomposition Process .....	41
6.2.1	Composition Agreement Unrealization .....	41
6.2.2	Composition Agreement Invalidation .....	41
6.2.3	Tear down of Security and Internetworking Connectivity .....	41
6.2.4	Media Channel Disabling .....	41
6.2.5	Decomposition Process Cooperation .....	42

6.3	Composition Update process .....	42
7	Potential Composition Requirements .....	42
7.1	High-level requirements .....	42
7.2	Security and Privacy .....	43
7.3	Functional requirements for Network Composition .....	43
8	Conclusions .....	45
9	Other concepts considered useful in the context of Network Composition .....	45
	<b>Annex A: (informative) Additional information on Network Composition .....</b>	<b>46</b>
A1	Illustration of composition procedure involving multiple Network Compositions .....	46
	<b>Annex B (Informative): Change history .....</b>	<b>49</b>
	History .....	50

---

## Foreword

This Technical Report has been produced by the 3<sup>rd</sup> Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

---

## Introduction

In the last couple of years an increasing number of heterogeneous network types have come to the focus of attention, e.g. heterogeneous access systems (otherwise known as multi-access), Personal Area Networks (PANs), Personal Networks (PNs), moving networks etc. This trend is expected to continue. Different scenarios have been studied in the All-IP Network (AIPN) Feasibility Study in TR 22.978 [5], which lists "network extensibility/composition" as a key aspect of AIPN. The integration of PANs and Personal Networks will be specified within the scope of the Personal Network Management (PNM) work item. Related Technical Specification work is ongoing within the AIPN Stage 1 in TS 22.258 [6] and Personal Network Management Stage 1 in TS 22.259 [7]. It would be desirable for 3GPP networks to be able to integrate many of these heterogeneous network types, or to interwork with them, in an efficient manner that for operators is easy to manage and control.

This Technical Report is the result of a feasibility study on Network Composition, the concept of heterogeneous network/system integration and interworking. It builds on the work of AIPN and studies Network Composition in more detail. This includes integration of networks with different administrative domains, and the dynamic and flexible integration of ad-hoc networks, PANs, WLANs etc. Particularly, the possibility for a uniform Network Composition procedure is explored, independent of what kind of network is "composed" with the 3GPP system. Complementing the AIPN work, in this report a concrete dynamic 'plug&play' and flexible Network Composition procedure is described.

---

# 1 Scope

The present document explores the feasibility of a uniform procedure for the integration of, and the interworking with, a large variety of heterogeneous network types. This uniform procedure is called Network Composition. It focuses on ad-hoc networks, PANs, moving networks etc., but also includes access systems. The goal is to avoid the need for defining a new procedure for integration / interworking with each newly emerging network type and to explore the feasibility of making the Network Composition procedure dynamic and to minimize human intervention ("plug and play"). Of course, the high security (authentication, authorization) standards of 3GPP must thereby be maintained. Finally, it is desirable for the Network Composition procedure to be flexible regarding what functionality is assumed in the composing network.

It is conceivable that roaming within a pre-set commercial and technological environment could be established dynamically using the same procedure.

This Feasibility Study covers the following aspects:

- Description of purpose and benefits of composition
- Composition use cases highlighting uniformity, dynamicity, security, manageability, scalability, flexibility, as well as business aspects
- Study of potential composition requirements
- Description of the composition process
- Definition of traits and/or implications of introducing this functionality into the 3GPP system, covering subjects such as management, multi-link radio access, mobility, context & policy awareness, security, and media transcoding & adaptation capabilities.

---

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 'D7-2 Ambient Networks Security Architecture', IST-2002-507134-AN/WP7/D02, F. Kohlmayer et al  
[http://www.ambient-networks.org/publications/D7-1\\_PU.pdf](http://www.ambient-networks.org/publications/D7-1_PU.pdf)
- [2] 'Host Identity Protocol Architecture', R. Moskowitz, P. Nikander  
<http://www.ietf.org/rfc/rfc4423.txt>
- [3] 'D3-2: Connecting Ambient Networks – Architecture and Protocol Design', IST-2002-507137-AN/WP3/D/3-2, J. Colás et al  
[http://www.ambient-networks.org/publications/AN\\_D3-2\\_for\\_publication.pdf](http://www.ambient-networks.org/publications/AN_D3-2_for_publication.pdf)
- [4] 3GPP TR 21.905: 'Vocabulary for 3GPP specifications'
- [5] 3GPP TR 22.978: 'All-IP Network (AIPN) feasibility study'
- [6] 3GPP TS 22.258: 'Service Requirements for the All-IP Network (AIPN); Stage 1'