



**Network Functions Virtualisation (NFV);  
NFV Security;  
Privacy and Regulation;  
Report on Lawful Interception Implications**

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**Reference**DGS/NFV-SEC004

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**Keywords**interception, NFV, privacy, regulation, security

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**ETSI**

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

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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

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## Foreword

This Group Specification (GS) has been produced by ETSI Industry Specification Group (ISG) Network Functions Virtualisation (NFV).

NOTE: Where the word "shall" appears in clauses 4 and 5 it has been taken from text originated in reference documents and offers a requirement against the operator of networks and services and in general does not place any additional technical constraints or conformance obligations on the NFV beyond those specified in the reference documents.

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## 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).

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# 1 Scope

The present document provides a problem statement on implementing LI in NFV and identifies the necessary capabilities to be provided in NFV to meet the requirements outlined for telecommunications capabilities in general in ETSI TS 101 331 [i.2].

The present document identifies the challenges of providing LI in an NFV. The present document is intended to give guidance to the NFV community and to the wider LI community on the provision of LI in an NFV.

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## 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 <http://docbox.etsi.org/Reference>.

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

Not applicable.

### 2.2 Informative references

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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 TS 101 671: "Lawful Interception (LI); Handover interface for the lawful interception of telecommunications traffic".
- [i.2] ETSI TS 101 331: "Lawful Interception (LI); Requirements of Law Enforcement Agencies".
- [i.3] ETSI TR 102 528: "Lawful Interception (LI) Interception domain Architecture for IP networks".
- [i.4] ETSI TS 103 120: "Lawful Interception; Interface for warrant information; Q & D LI Agnostic".

NOTE: In draft stage at the time of publication.

## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI TS 101 671 [i.1] and the following apply:

**Content of Communication (CC):** information exchanged between two or more users of a telecommunications service, excluding intercept related information

NOTE: This includes information which may, as part of some telecommunications service, be stored by one user for subsequent retrieval by another.

**Handover Interface (HI):** physical and logical interface across which the interception measures are requested from Communications Service Provider (CSP), and the results of interception are delivered from a CSP to a law enforcement monitoring facility

**Intercept Related Information (IRI):** collection of information or data associated with telecommunication services involving the target identity, specifically communication associated information or data (e.g. unsuccessful communication attempts), service associated information or data and location information

**interception:** action (based on the law), performed by a CSP, of making available certain information and providing that information to a law enforcement monitoring facility

**interception interface:** physical and logical locations within the CSP telecommunications facilities where access to the content of communication and intercept related information is provided

NOTE: The interception interface is not necessarily a single, fixed point.

**Internal Network Interface (INI):** network's internal interface between the Internal Intercepting Function (IIF) and a mediation device

**Law Enforcement Agency (LEA):** organization authorized by a lawful authorization based on a national law to request interception measures and to receive the results of telecommunications interceptions

**Law Enforcement Monitoring Facility (LEMF):** law enforcement facility designated as the transmission destination for the results of interception relating to a particular interception subject

**mediation device:** equipment which realizes the mediation function

**Mediation Function (MF):** mechanism which passes information between a network operator, an access provider or service provider and a handover interface, and information between the internal network interface and the handover interface

**target identity:** technical identity (e.g. the interception's subject directory number), which uniquely identifies a target of interception

NOTE: One target may have one or several target identities.

### 3.2 Abbreviations

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

ADMF	ADMInistration Function
AF	Administration Function
CC	Content of Communication
CCCI	Content of Communication Control Interface
CC-IIF	Communications Content - Internal Interception Function
CCTF	Content of Communication Trigger Function
CCTI	Content of Communication Trigger Interface
CSP	Communications Service Provider
FE	Functional Entity
HI	Handover Interface

HI1	Handover Interface Port 1 (for Administrative Information)
HI2	Handover Interface Port 2 (for Intercept Related Information)
HI3	Handover Interface Port 3 (for Content of Communication)
IIF	Internal Interception Function
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
INI	Internal Network Interface
IP	Internet Protocol
IRI	Intercept Related Information
LEA	Law Enforcement Agency
LEMF	Law Enforcement Monitoring Facility
LI	Lawful Interception
LIAF	Lawful Interception Administration Function
MANO	Management and Orchestration
MF	Mediation Function
NFV	Network Functions Virtualisation
PKC	Public Key Certificate
PoI	Point of Interception
SIP	Session Initiation Protocol
TC	Technical Committee
VM	Virtual Machine

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## 4 Requirements for Lawful Interception

### 4.1 General CSP obligations

The obligation to support LI applies irrespective of traffic type, signalling format or network configuration. The obligations are not specific to the NFV domain but rather apply to the end-to-end service.

There is a broad obligation to remove encoding provided by the CSP before material is handed over to the LEA, but if this cannot be done, the obligation to hand the material over still applies. This means that if the target is using some form of end-to-end encryption the intercepted material is handed over even if the clear text is not available.

There are two primary components for legacy LI acquisition and handover:

- Intercept Related Information (IRI), e.g. associated signalling and call/log record information.
- Content of Communication (CC), i.e. streaming traffic.

Where IRI and/or CC is acquired and handed over the CSP is obliged to indicate the time and location (virtual and geographic) of the Point of Interception (PoI) for CC and IRI information.

In many jurisdictions, an array of retained data requirements associated with communications may also be required as part of the Lawful Interception obligations, but is outside the scope of the present document.

The present document acknowledges the legal basis for such activities by reference to the requirements established in ETSI TS 101 331 [i.2].

### 4.2 Root of trust in LI

In LI implementations the active components (i.e. the PoI for each of CC and IRI) act upon requests received from an LI administration function that acts as the root of trust for those components. In the wider NFV environment the instantiation and operation of virtualised components has a root of trust in a wider set of components that may include the orchestrator function, the hypervisor function, and the generalized MANO functions. The roots of trust for general NFV and for LI operations may be distinct but are required to interoperate such that LI functions can be instantiated as general NFV components.

## 4.3 Core requirements

The convention in LI is to have the operator (CSP) domain support 3 interfaces to the Law Enforcement Monitoring Facility:

- HI1 - For administration, normally maps to the internal interface INI1.
- HI2 - For transfer of intercept related information, normally maps to the internal interface INI2.
- HI3 - For transfer of the content of communication, normally maps to the internal interface INI3.

When considering the NFV environment the LI capability will most likely be implemented as a service that extends existing services under strict access control policy. The relatively formal requirements for LI in the NFV are as follows:

- The LI service capability shall always be provided.
- The LI service shall be activated upon issue of a valid interception order from an LEA. The LI service shall be deactivated when the interception warrant expires or as defined by the LEA.

NOTE 1: The details of the interception order and the validation of it are a national concern but guidance is given in ETSI TS 103 120 [i.4].

- The LI service shall be invoked on any communication authorized for interception from or to the target visible to the network.
- Interrogation shall be possible only from an authorized user. Where audit records are maintained for the service (required by the International User Requirement) access shall be possible only from an authorized user.
- An authorized user for the purposes of interrogation is one who is allowed and authorized by both LEA and the CSP to administer the LI interface.
- There shall be no interaction with other services.

NOTE 2: This means that the invocation of LI is not intended to alter the operation of any service and any resulting modification implies non-compliance to the requirements and breaks the primary requirement that the LI measure is only visible to authorized entities.

In rather more detail the CSP at the point of interception shall, in relation to each target service:

- a) provide the content of communication;
- b) remove any service coding or encryption which has been applied to the content of communication and the intercept related information at the instigation of the network operator/service provider;

NOTE 3: If coding/encryption cannot be removed through means which are available to the CSP for the given communication the content is provided as received.

NOTE 4: The semantic meaning has to always be transferred even if the exact syntax (encoding) is modified.

- c) provide the LEA with any other decryption keys whose uses include encryption of the content of communication, where such keys are available;
- d) intercept related information shall be provided:
  - 1) when communication is attempted;
  - 2) when communication is established;
  - 3) when no successful communication is established;
  - 4) on change of status (e.g. in the access network);
  - 5) on change of service or service parameter;
  - 6) on change of location (this can be related or unrelated to the communication or at all times when the apparatus is switched on); and

- 7) when a successful communication is terminated.

NOTE 5: In the present document, service should be taken to include supplementary services.

NOTE 6: For those protocols of type Representational State Transfer (REST) (e.g. SIP, HTTP) each transaction is considered as unique unless the signalling itself contains a means to link signals (e.g. session identity).

- e) intercept related information shall contain:
- 1) the identities that have attempted telecommunications with the target identity, successful or not;
  - 2) the identities which the target has attempted telecommunications with, successful or not;
  - 3) identities used by or associated with the target identity;
  - 4) details of services used and their associated parameters;
  - 5) information relating to status;
  - 6) time stamps;
  - 7) location of the target.

NOTE 7: The identity to be supplied should be that visible to the CSP and may take one or many forms including but not restricted to IMSI, IMEI, MSISDN, email address, SIP-identity.

- f) the conditions mentioned above also apply to multi-party or multi-way telecommunication if and as long as the target is known to participate.

NOTE 8: Where the user has initiated and applied end-to-end encryption, the content is provided as received.

## 4.4 PoI location attestation

The lawful authorization that invokes the lawful interception facilities has to identify the jurisdiction in which the authorization is valid, and the CSP has to ensure that the LI facilities operate within the same jurisdiction. The underlying hardware of any NFV is physically located in specific jurisdictions and whilst the VMs are intended to run on any viable hardware and not to have knowledge of which instance of the hardware they run on this knowledge has to be within the system and should be able to be reported to the LEA. Furthermore when LI is activated against a target, the system management (e.g. MANO) cannot instantiate any VM required to support LI for the user service outside the jurisdiction if the target is in the jurisdiction of the lawful authorization.

## 4.5 LI undetectability

Much of the data for the provision of LI is sensitive and should be protected from illicit exposure including transfer across jurisdictional borders. In particular the knowledge of targets of interception (often referred to as the target list) shall not be visible to any unauthorized party.

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# 5 Analysis and recommendations

## 5.1 Overview

It should be noted that LI has often looked at the interception of communication between 2 parties, or at the communications initiating or terminating at a single party (the target). In this respect much of the terminology may be considered to be based on conventional circuit switching but that is an over-simplification. The aim in general is to ensure that whenever a target is involved in a communication that the knowledge of that communication, and the content of that communication, is also delivered to the facilities of the Law Enforcement Agency (typically referred to as Law Enforcement Monitoring Facility (LEMF)).