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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
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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Reconfigurable Radio Systems (RRS).

The present document is part 2 of a multi-part deliverable. Full details of the entire series can be found in part 1 ETSI TS 103 652-1 [1].

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 specifies the system architecture for the operation of an Evolved Licensed Shared Access (eLSA) System, enabling the provision of spectrum access to many local high-quality wireless networks in dedicated licensed and leasing scenarios.

The eLSA system architecture specification will include the identification and definition of the logical functional elements, interfaces, reference points, the mapping of functions to logical entities as well as the definition of the high-level procedures and information flows enabling assignment and handling of spectrum for the different scenarios considered.

The present document has been developed following, and in accordance with, the system requirements for eLSA captured in ETSI TS 103 652-1 [1] and the feasibility study on temporary spectrum access for local high-quality wireless networks as documented in ETSI TR 103 588 [i.1].

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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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 TS 103 652-1: "Reconfigurable Radio Systems (RRS); evolved Licensed Shared Access (eLSA); Part 1: System requirements".

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 TR 103 588: "Reconfigurable Radio Systems (RRS); Feasibility study on temporary spectrum access for local high-quality wireless networks".
- [i.2] ETSI TS 103 235: "Reconfigurable Radio Systems (RRS); System architecture and high level procedures for operation of Licensed Shared Access (LSA) in the 2 300 MHz - 2 400 MHz band".
- [i.3] ECC Recommendation (15)04: "Guidance for the implementation of a sharing framework between MFCN and PMSE within 2300-2400 MHz".
- [i.4] CEPT Report 58: "Technical sharing solutions for the shared use of the 2300-2400 MHz band for WBB and PMSE".

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

allowance zone: geographical area within which an eLSA Licensee is allowed to operate radio transmitters on its assigned spectrum resource

NOTE 1: An allowance zone is defined using specific measurement quantities and thresholds, e.g. a maximum field strength level expressed in dB μ V/m/MHz, along the border of its geographical area.

NOTE 2: An allowance zone is normally applicable for a defined frequency range and time period.

3.2 Symbols

Void.

3.3 Abbreviations

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

3GPP	Third Generation Public Private Partnership
AV	Audio-Visual
AV-VSP	Audio-Visual Vertical Sector Player
DOM	Detached Operation Mode
eLC	evolved eLSA Controller
eLR	evolved LSA Repository
eLSA	evolved Licensed Shared Access
eLSR	evolved LSA Spectrum Resource
eLSRAI	evolved LSA Spectrum Resource Availability Information
IEM	In Ear Monitoring
LC	LSA Controller
LR	LSA Repository
LSA	Licensed Shared Access
LSRAI	LSA Spectrum Resource Availability Information
MFCN	Mobile/Fixed Communication Network

NOTE: MFCN is used in the present document to refer to a local high-quality wireless network [i.1].

MNO	Mobile Network Operator
NRA	National Regulatory Authority
PMSE	Programme Making and Special Events
VSP	Vertical Sector Player

4 eLSA supported spectrum access schemes

4.1 Introduction

ETSI TR 103 588 [i.1] concept identified three spectrum access schemes for MFCN operated by vertical sector operators (aka *local high-quality wireless networks*):

- **Local area licensing:** NRA provides a license to a vertical sector player to operate in a given frequency allocation in a defined area and for a defined period of time. The vertical sector player (licensee) shall apply the required operational conditions and restrictions established by the NRA.

- **Local area Leasing:** Incumbents (including MNOs) can lease out part of their licensed spectrum to vertical sector players (lessees) to operate MFCNs in a defined area and for a defined period of time. An Incumbent (lessor) and a vertical sector player (lessee) agrees through a leasing arrangement, where the existing rules and operational conditions given in the incumbent's license is included (the incumbent is still responsible for the fulfilment of those rules/conditions to the NRA). The leasing arrangement can include additional operational conditions and restrictions for the use of the leased spectrum. An additional license for vertical sector players is not needed.
- **Network as a Service:** MFCNs of a vertical sector player are instantiated as local network service areas (e.g. network slices of a 3GPP network) within the incumbent (e.g. MNO) domain. The incumbent as license holder offers infrastructure, spectrum and coexistence management service to the MFCNs. An additional license for vertical sector players is not needed.

Figure 1 illustrates the relationships between the National Regulatory Administration (NRA), the vertical sector player, and the incumbent (e.g. MNO) for the different spectrum allocation and service provisioning schemes.

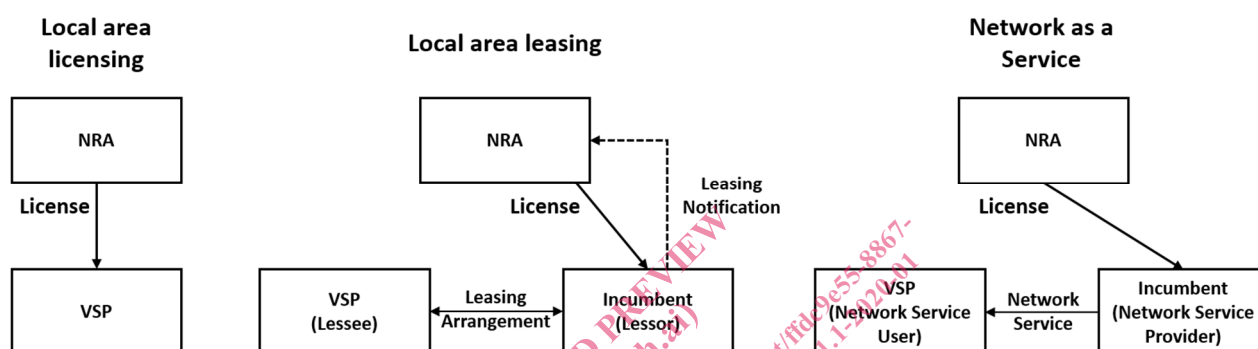


Figure 1: Relationship models for eLSA spectrum access schemes.

eLSA aims to evolve the LSA architecture [i.2] to satisfy the local area spectrum demands covering both short-term and long-term allocations of vertical sector players. In doing so eLSA targets a system architecture as close as possible to LSA maximizing synergies at both implementation and regulatory levels.

Annex C provides for two of the spectrum access schemes identified in [i.1], local area licensing and local area leasing, an architectural instantiation of eLSA, the associated functionality and a list of the technical evolvments compared to the LSA reference architecture model [i.2]. The Network as a Service option will not be further specified in the present document as it is handled within the license holder domain.

4.2 eLSA Architecture Reference Model

4.2.0 introduction

The eLSA Architecture Reference model is shown in Figure 2. It is based on the architecture reference model for LSA defined in [i.2] and supports additionally the spectrum access schemes for local area licensing and the local area leasing. Reference points shown in dashed format indicate that the respective interfaces and corresponding interface functions will not be defined in the present document, although some guidance is provided.

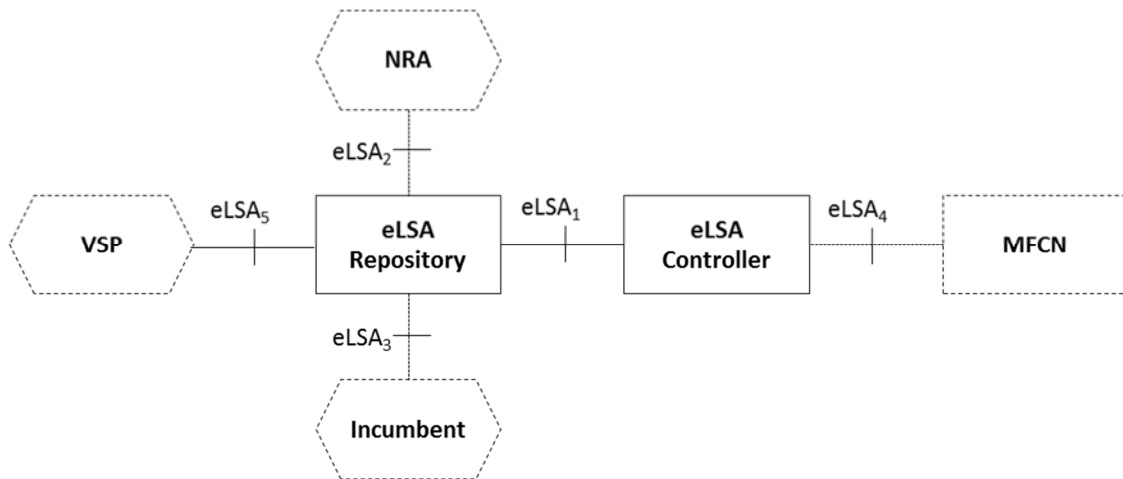


Figure 2: eLSA Architecture Reference Model

4.2.1 Logical Elements

eLSA Repository (eLR): The eLR supports the entry and storage of information describing the shared spectrum resources as well as Incumbent's and VSP's usage and protection requirements. It is able to convey spectrum resource information including related availability information to eLSA Controllers. The eLR also provides means for the NRA to monitor the operation of the eLSA System [see ETSI TS 103 652-1 [1]] and to provide the eLSA System with information on local area licensing and local area leasing. The eLR ensures that the eLSA system operates in conformance with the Sharing Framework and the licensing regime and may in addition realize any non-regulatory details of the Sharing Arrangement [1].

eLSA Controller (eLC): The eLC is associated with the VSP's domain. The eLC enables the VSP to obtain eLSA spectrum resource and availability information from the eLR. The eLC interacts with the VSP's MFCN in order to support the mapping of spectrum resource and availability information into appropriate radio transmitter configurations and receive the respective confirmation from the MFCN.

4.2.2 Reference Points

- eLSA₁:** Reference point between eLR and eLC.
- eLSA₂:** Reference point for Administration/NRA interaction with the eLR. Some of the functionality associated with this reference point is described in clause B.2.
- eLSA₃:** Reference point for Incumbent interaction with the eLR. Some of the functionality associated with this reference point is described in clause B.3.
- eLSA₄:** Reference point between eLC and MFCN.
- eLSA₅:** Reference point for VSP interaction with the eLR. Some of the functionality associated with this reference point is described in clause B.4.

4.3 High-Level Functions

4.3.0 introduction

This clause lists and describes the high-level functions performed by the eLSA System. The high-level functions cover the aspects of eLSA System operation in line with requirements of ETSI TS 103 652-1 [1].

4.3.1 Information Entry Function

The information entry function allows the entry and storage of information that is needed for the operation of the eLSA System, including the following:

- Sharing Framework information (set of sharing rules or sharing conditions for the band, information on spectrum that can be made available for shared use and the corresponding technical and operational conditions for its use, identification of incumbents).
- eLSA License and Leasing information (VSP identity and related information).
- Sharing Arrangement information for each Incumbent and VSP (set of practical details for sharing an eLSA spectrum resource, whereby eLSA spectrum resource may be used by Incumbent or VSP).
- Incumbent's eLSA spectrum resource usage and protection requirements.
- The function also supports the verification of inputs (consistency with Sharing Framework/Arrangement).

4.3.2 Information Processing Function

This function supports the derivation of eLSRAI for each VSP domain, to be provided to the Information Exchange function and the Reporting Function. The eLSRAI is derived based on the data collected by the Information Entry Function. The function further supports the processing of VSP domain acknowledgment information.

The above functionality also includes support for multiple Incumbents and multiple VSP domains, scheduled and on-demand modes of operation, and logging of processing information.

4.3.3 Information Mapping Function

The information mapping function receives eLSRAI, confirms reception and initiates respective operations in the MFCN. It also sends acknowledgements to the information exchange function (for forwarding to the information processing function) when changes in the MFCN are processed.

NOTE: The respective interaction with the MFCN is out of scope of the present document.

4.3.4 Reporting Function

The reporting function is responsible to create and provide reports regarding the eLSA System operation to Administration/NRA, Incumbent(s), and/or VSP(s) on an on-demand or scheduled basis, e.g. pre-checking of spectrum resource availability for a local area.

4.3.5 eLSA Information Exchange Function

The information exchange function supports communication mechanisms, internal to the eLSA System, to exchange spectrum resource and availability information, and related acknowledgement information.

4.3.6 System Support Functions Group

The system support functions comprise:

Security Support Function: support of authentication and authorization as well as services to support integrity and confidentiality of data.

Robustness and Reliability Function: support of mechanisms to maintain robustness and reliability against failures and malicious attacks.

Fault Management Function: support of:

- Failure detection in the eLSA System.
- Subsequent generation and delivery of respective failure notification(s) to VSP(s) and Incumbent(s).

- Initiation of respective operations in the eLSA System.

4.3.7 System Management Functions Group

This includes:

- Operation, administration and maintenance tasks in the eLSA System.
- Identity management (comprising user identity and authentication management, and user authorization profiles).

System management is separate for eLR and eLC since these logical entities belong to different operation domains. The supported functionality may also be different in the two entities. Identity management applies to the eLR only.

4.4 Mapping of High-Level Functions to Logical Elements

Figure 3 shows how the high-level functions and function groups are mapped to the logical entities eLR and eLC.

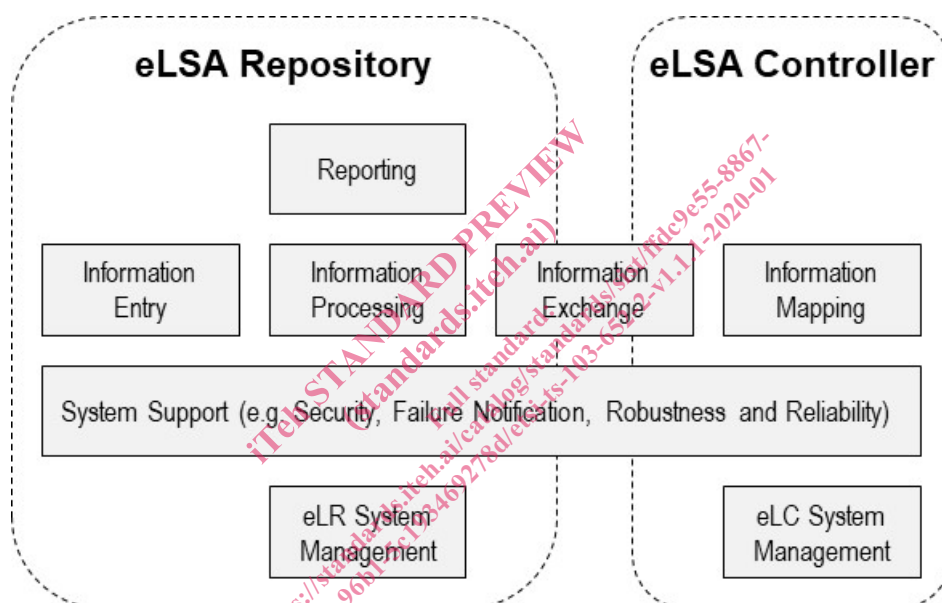


Figure 3: Mapping of high-level functions and function groups to logical elements

The System Support functions group may be considered to map across all elements and reference points of the eLSA System.

The corresponding functionality at the eLSA₁ reference point is covered by the eLSA Information Exchange function and the System Support functions group.

5 eLSA₁ Functional Description and Information Flows

5.1 Introduction

This clause describes procedures, procedural flows and additional functional aspects related to the interface between eLR and eLC (eLSA₁ interface).

The eLSA₁ interface provides support for the exchange of eLSA Spectrum Resource Availability Information (eLSRAI, clause 5.4.2) and respective acknowledgement information between eLR and eLC, and for maintaining and recovering synchronization of such information between eLR and eLC.