ETSI TS 103 652-3 V1.1.1 (2021-01)

TECHNICAL SPECIFICATION

**Reconfigurable Radio Systems (RRS);
evolved Licensed Shared Access (eLSA);
Part 3: Information elements and protocols for
the interface between eLSA Controller (eLC) and
eLSA Repository (eLR)**

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

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 defines the application protocol on the $eLSA_1$ interface, between eLSA Controller (eLC) and eLSA Repository (eLR) ($eLSA_1$ protocol) [i.3], and the content of the eLSA Spectrum Resource Availability Information (eLSRAI) conveyed by this protocol. It is based on the System Requirements defined in ETSI TS 103 652-1 [i.2] and the System Architecture and High-Level Procedures defined in ETSI TS 103 652-2 [i.3].

The present document supports the operation of MFCNs operated by vertical sector players under the evolved Licensed Shared Access (eLSA) system, aimed at enabling the automatic provision of local spectrum access rights to vertical sector players through:

- licenses acquired in advanced from the NRA and provided by the eLSA procedures; and/or

- licenses/leases acquired and provided by the eLSA procedures.

The operation of eLSA is frequency agnostic. The application of eLSA to concrete frequency bands depends on national regulatory decisions.

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 https://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 TR 103 588: "Reconfigurable Radio Systems (RRS); Feasibility study on temporary spectrum access for local high-quality wireless networks".

[i.2]   ETSI TS 103 652-1: "Reconfigurable Radio Systems (RRS); evolved Licensed Shared Access (eLSA); Part 1: System requirements".

[i.3]   ETSI TS 103 652-2: "Reconfigurable Radio Systems (RRS); evolved Licensed Shared Access (eLSA); Part 2: System architecture and high-level procedures".

[i.4] ETSI TS 103 379 (V1.1.1): "Reconfigurable Radio Systems (RRS); Information elements and protocols for the interface between LSA Controller (LC) and LSA Repository (LR) for operation of Licensed Shared Access (LSA) in the 2 300 MHz - 2 400 MHz band".

[i.5] ETSI TS 138 101 (all parts): "5G; NR; User Equipment (UE) radio transmission and reception (3GPP TS 38.101)".

[i.6] CEPT Report 58: "Report B2 from CEPT to the European Commission in response to the Mandate on 'Harmonised technical conditions for the 2300-2400 MHz ('2.3 GHz') frequency band in the EU for the provision of wireless broadband electronic communications services. 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 can 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 dBμ 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.

detached operation mode: operation mode where a VSP operates a MFCN without a permanent network connection

NOTE: The point of detachment between the VSP and the eLSA system can be located at the eLSA$_1$ and/or the eLSA$_4$ interface.

eLSA spectrum resource availability information: information provided to a Licensee, which conveys the eLSA spectrum resource that may be used by the Licensee, and the respective operational conditions or restrictions

eLSRAI context: set of zones and their parameters that are to be maintained by the nodes (eLC and eLR) for a license/lease for a VSP in an instance of the eLSA1 interface

eLSRAI synchronization process: process to synchronize the eLSRAI context between eLC and eLR

idle zone: zone which has been defined but which is not currently operational

license/lease identity: identifies the individual rights of use of a license or lease of an eLSA spectrum resource in a defined area for a specified amount of time

Mobile/Fixed Communication Network (MFCN): referring to a local high-quality wireless network as defined in ETSI TR 103 588 [i.1]

operational zone: zone to be considered by the Licensee, when making use of the eLSA spectrum resource

sharing arrangement: set of practical details for sharing an eLSA spectrum resource

sharing framework: set of sharing rules or sharing conditions that will materialize the change, if any, in the spectrum rights of the Incumbent(s) and define the spectrum, with corresponding technical and operational conditions, that can be made available for alternative usage under eLSA

spectrum resource: resource or set of resources defined in time, space and frequency domains

vertical sector player: entity holding the individual right of use to an eLSA spectrum resource

NOTE: A license or a lease.

3.2   Symbols

Void.

3.3   Abbreviations

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

ACLR	Adjacent Channel Leakage Ratio
ACS	Adjacent Channel Selectivity
BW	BandWidth
DOM	Detached Operation Mode
EIRP	Equivalent Isotopically Radiated Power
eLC	evolved LSA Controller
eLR	evolved LSA Repository
eLSR	eLSA Spectrum Resource
eLSRAI	evolved LSA Spectrum Resource Availability Information
ID	IDentifier
IE	Information Element
L-Id	License/Lease Identity
MFCN	Mobile/Fixed Communication Network
NRA	National Regulatory Authority
PMSE	Programme Making and Special Events
RF	Radio Frequency
TRP	Total Radiated Power
UTC	Coordinated Universal Time
VSP	Vertical Sector Player

4   eLSA Spectrum Resource Availability Information: Description and Supported Functionality on eLSA$_1$

4.1   Introduction

Clause 4 contains a high-level description of the eLSA Spectrum Resource Availability information (eLSRAI), and eLSRAI-related functionality supported by the eLSA functional nodes (eLC and eLR), and the interface eLSA$_1$. Main scope is to extend the related material in the stage 2 specification of ETSI TS 103 652-2 [i.3], and to describe details for the eLSA$_1$ protocol and its operation.

4.2   DOM Handling

As described in clause A.7 of ETSI TS 103 652.2 [i.3], the eLSA system can work in detached operation mode (DOM) and foresees two possible points of temporary detachment within the eLSA system:

1)   At the eLSA$_1$ interface, i.e. the connection between an eLC and an eLR can be temporarily disconnected.

2)   At the eLSA$_4$ interface, i.e. the connection between an MFCN and its eLC can be temporarily disconnected.

While the disconnection of the eLSA$_4$ interface may have impact on the response times and the end to end acknowledgement handling of eLSRAI changes at the eLSA$_1$ interface, the disconnection of the eLSA$_1$ interface will basically prevent that the eLR can initiate any eLSA$_1$ procedure until eLC re-initiate eLSA$_1$ interface.

The possibility for a VSP to operate an eLSA Spectrum Resource (eLSR) in DOM is defined in the license/lease. Depending on national regulation, some eLSRs may allow detached operation but others may not. Such rules as well as the maximum allowed duration of the DOM period are defined in the Sharing Framework and/or the Sharing Arrangement.

In DOM scenarios where the eLSR is not pre-allocated and needs to be assigned by eLR, eLC provides the information on DOM with the eLSR Grant Request message.

When DOM for the eLSR is allowed and the VSP selects $eLSA_1$ interface as detachment point, the eLC initiates the DOM by sending an eLSRAI Confirmation Request message containing the $eLSA_1$ detachment point information to the eLR. After receiving the eLSRAI Confirmation Response the eLC can temporarily detach from the eLR. During the DOM period, eLC can re-initiate $eLSA_1$ whenever it needs it. For that, eLC will send a Confirmation Request message to eLR.

For eLCs serving several VSPs, as considered in clause A.8 of ETSI TS 103 652-2 [i.3], a VSP requesting DOM can only imply a disconnection of the $eLSA_4$.

4.3   eLSRAI Scope

eLSA Spectrum Resource Availability Information (eLSRAI) is information provided to a VSP, which conveys information on the eLSA spectrum resource that may be used by a VSP. The information exchange of eLSRAI shall comply with Sharing Framework, Sharing Arrangements, and further national laws to protect privacy data. As described in ETSI TS 103 652-2 [i.3], eLSRAI is generated in the eLR, and sent to the eLC over the $eLSA_1$ interface, using $eLSA_1$ protocol messages. A VSP may be granted more than one license and/or lease. Each license or lease will have its own instance of an eLSRAI.

Under eLSA operation, the spectrum resources which are allocated to the respective VSP may not be predefined, and therefore such information needs to be conveyed over $eLSA_1$ as part of eLSRAI. Further eLSRAI may include any additional operational conditions or restrictions that the VSP shall apply.

NOTE: It is a deployment choice whether permanent restrictions contained in the Sharing Framework or Sharing Arrangements, are conveyed to the eLC as part of eLSRAI.

The conditions or restrictions within eLSRAI may apply to the licensed spectrum resource, or to a subset (described in frequency, space, time or a combination of these).

4.4   eLSRAI Definition

eLSRAI has the following characteristics:

- It contains a license/lease identity (L-ID).

- It contains one or more *Zones*. A *Zone* is an information object which describes a set of operational conditions or restrictions to be applied by the VSP.

- A *Zone* has a *Zone Type* associated to it (e.g. allowance, restriction, protection, exclusion).

- A *Zone* contains space, frequency, radio and time parameters (e.g. validity time):

  - Space parameters describing the geographical area to which the set of operational conditions or restrictions applies.

  - Frequency parameters describing the frequency range to which the set of operational conditions or restrictions applies.

  - Time parameters describing when the set of operational conditions or restrictions applies.

  - Radio parameters describing the RF operational conditions or restrictions to be applied within the space/frequency/time combination defined by the above parameters.

- A *Zone* has a *Zone ID* and a *Zone Configuration Index* associated to it.

- It contains optionally information about geographically located neighbours' spectrum and time allocations. The knowledge that there are neighbouring/adjacent licenses (or possibly leasing agreements) may be useful information:

  - To negotiate Sharing Arrangements.

  - To coordinate interference behaviour between neighbours when planning/configuring the radio network.

NOTE: When eLSRAI is conveyed over the eLSA$_1$ interface, each *Zone* is associated to a *Zone Action*.

4.5   eLSRAI Handling Functionality

4.5.1   General

As described in ETSI TS 103 652-2 [i.3], the eLSA Information Exchange Function supports communication mechanisms to exchange eLSRAI and related acknowledgment information between eLR and eLC.

Clauses 4.4.2 and 4.4.3 further specify the related functional split between eLR and eLC in support of this high-level function.

4.5.2   eLR Support

The eLR supports the eLSA Information Exchange Function by:

- Providing a license or a lease by constructing *Zone* information including type and parameters for each *Zone*.

- Assigning a *Zone ID*, which uniquely identifies a *Zone* over all instances of the eLSA$_1$ interface for a given eLR.

- Assigning a *Zone Configuration Index*, which uniquely identifies the particular configuration (set of *Zone* parameters).

- Conveying the *Zone* information towards concerned eLCs.

- Monitoring the status of eLSRAI conveyed to the eLC (e.g. per- *Zone* acknowledgment and confirmation).

- Conveying a modification of *Zone* parameters towards the eLC (with corresponding *Zone Configuration Index*).

- Conveying deletion of a *Zone* towards the eLC.

- Synchronizing eLSRAI with the eLC.

4.5.3   eLC Support

The eLC supports the eLSA Information Exchange Function by:

- Requesting a license or a lease using the Grant procedure.

- Receiving and acknowledging eLSRAI (including checking of parameters).

- Confirming eLSRAI.

- Synchronizing eLSRAI with the eLR.

4.6   eLSRAI Context

The eLSRAI Context is the complete set of zones and their parameters that are to be maintained by the nodes (eLC and eLR) in an instance of the eLSA$_1$ interface for an L-Id. The eLR determines the eLSRAI Context and informs the eLC of any changes due to creation, modification or deletion of zones.

When receiving zone information, the eLC shall consider that:

- a *Zone* with a *Zone Action* set to "Create" is to be added to the eLSRAI Context (including its parameters);

- a *Zone* with a *Zone Action* set to "Modify" is to be kept in the eLSRAI Context (including modified parameter set);

- a *Zone* with a *Zone Action* set to "Delete" is to be removed from the eLSRAI Context.

There is no relationship between the current status of a *Zone* (idle/operational), and whether the *Zone* is part of the eLSRAI Context. The eLSRAI Context may therefore include both idle and operational zones at any moment in time.

NOTE: The eLR may define a *Zone* in such a way that it is idle (at the time that it is conveyed to the eLC) and has no future idle-operational transition. During operation of the $eLSA_1$ interface, the eLR may modify the time parameters of the *Zone* such that it will trigger an idle-operational transition at any desired point in time.

4.7   eLSRAI Synchronization

eLSRAI Synchronization is the process used to synchronize the eLSRAI of eLR and eLC. eLSRAI Synchronization is supported by the eLSA Information Exchange Function in ETSI TS 103 652-2 [i.3]. The eLSRAI Synchronization process can be initiated by either eLC or eLR at any time.

The provision of the eLSRAI Context from the eLR towards the eLC uses either the eLC-initiated eLSRAI Request procedure (clause 6.5) or the eLR-initiated eLSRAI Notification procedure (clause 6.6). The eLSRAI Context may optionally be segmented over two or more instances of the same procedure.

All procedures that are part of an eLSRAI Synchronization process shall be identified by a specific synchronization process identity.

An eLSRAI Synchronization process may be used to reset the eLSRAI Context at the eLC. In the case of eLSRAI Synchronization with context reset, the eLC shall immediately replace the eLSRAI Context with the newly received context and shall consider that all zones in the eLSRAI Context require confirmation [i.3]. If no context reset is requested by the eLR, the eLC:

- shall use the information received to update the local eLSRAI Context at the eLC;

- shall consider that any existing zones not included in the received eLSRAI Context are implicitly deleted;

- shall consider that confirmations are required for new or modified zones.

Once an eLSRAI Synchronization process is initiated, any existing eLSRAI-handling procedures shall be considered terminated. A node receiving an initiating message for an eLSRAI-handling procedure while an eLSRAI Synchronization process is ongoing shall fail such procedure with an appropriate cause e.g. "Synchronization ongoing", except if the new procedure indicates the initiation of a new eLSRAI Synchronization process. In this case, the old eLSRAI Synchronization process shall be considered to have been unsuccessfully terminated.

4.8   eLSRAI Confirmation

As described in ETSI TS 103 652-2 [i.3], the eLSA Information Exchange Function supports means for the eLC to notify the eLR once the necessary configuration changes in the MFCN have been applied according to the received eLSRAI.

Confirmation may also be used by the eLC to inform the eLR that the configuration changes cannot be implemented ('negative confirmation').

The eLC shall explicitly provide confirmation for each zone within the eLSRAI Context. Each zone shall be confirmed at least once. If the configuration of an existing zone is modified, the eLC shall consider that a further confirmation is required for the zone (regardless of whether it had been previously confirmed, and regardless of the modification details). In order to identify the configuration that is confirmed, the eLC shall include both the *Zone ID* and the *Zone Configuration Index* within the confirmation signalling.

If the received eLSRAI contains zones whose time configuration includes multiple operational periods (i.e. scheduled or periodic zones), the eLC shall provide confirmation for each zone at least once (in connection with the first operational period), meaning that exactly a single confirmation will be sent and that this single confirmation is enough to confirm successive idle-operational transitions of the zone that may happen later.

When a VSP works in Detached Operation Mode (DOM), eLSRAI Confirmation shall follow the behaviour in clause 4.2.

NOTE: Confirmation messages may be sent by the eLC more than once for a given combination of Zone ID and Zone Configuration Index (e.g. in the case of scheduled or periodic zones, an initial positive confirmation is sent by the eLC; later the MFCN is not able to comply with a subsequent operational period, and a negative confirmation is sent). In all cases, the confirmation status of the last received message overwrites any previously received information.

4.9 eLC Handling of non-impacting Zones

The eLC may receive a zone configuration such that the eLC has identified that no MFCN resource is impacted by the zone. The eLC shall however consider that the zone (and its information) forms part of the eLSRAI Context.

The eLC shall also act as if the necessary configuration changes have been applied, by sending an associated confirmation for any such zone towards the eLR.

5 eLSA1 Protocol Principles

5.1 Notation

For the purpose of the present document, the following notations apply:

Procedure   When referring to an elementary procedure in the specification, the procedure name is written with the first letters in each word in upper case characters followed by the word "procedure", e.g. ELSRAI Notification procedure.

Message   When referring to a message in the specification, the message name is written with all letters in upper case characters followed by the word "message", e.g. ELSRAI NOTIFICATION message.

IE   When referring to an information element (IE) in the specification, the IE name is written with the first letters in each word in upper case characters and all letters in italic font followed by the abbreviation "IE", e.g. *Space* IE.

Value of an IE   When referring to the value of an IE in the specification, the value is written enclosed by quotation marks, e.g. "Value".

5.2 eLSA1 Protocol Procedures

The eLSA$_1$ protocol procedures are classified in the following categories:

1)   eLSRAI handling procedures.

2)   Interface management procedures.

The eLSRAI handling procedures are those procedures whose primary function is to convey eLSRAI, or to exchange information directly related to the provision of eLSRAI (e.g. confirmation).

The interface management procedures are those procedures whose primary function is to set up, maintain or discontinue an eLSA$_1$ interface instance.

Tables 5.2-1 and 5.2-2 show the procedures and messages for each category.