ETSI TS 103 652-3 V1.1.2 (2021-06)

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.

Table 5.2-1: eLSRAI Handling Procedure

eLSA1 Protocol Procedure	Initiating Message	Response Message
ELSRAI Notification	ELSRAI NOTIFICATION	ELSRAI NOTIFICATION ACK
ELSRAI Request	ELSRAI REQUEST	ELSRAI RESPONSE
ELSRAI Confirmation	ELSRAI CONFIRMATION REQUEST	ELSRAI CONFIRMATION RESPONSE
ELSR Grant	ELSR GRANT REQUEST	ELSR GRANT RESPONSE
ELSR Grant Relinquishment	ELSR GRANT RELINQUISHMENT REQUEST	ELSR GRANT RELINQUISHMENT RESPONSE

Table 5.2-2: Interface Management Procedure

eLSA1 Protocol Procedure	Initiating Message	Response Message
Registration	REGISTRATION REQUEST	REGISTRATION RESPONSE
Deregistration	DEREGISTRATION REQUEST	DEREGISTRATION RESPONSE
Connectivity Check Notification	CONNECTIVITY CHECK NOTIFICATION	CONNECTIVITY CHECK NOTIFICATION ACK
Connectivity Check Request	CONNECTIVITY CHECK REQUEST	CONNECTIVITY CHECK RESPONSE

5.3   Identification of Procedures and Messages

Each message defined in the $eLSA_1$ protocol (as listed in the tables 5.2-1 and 5.2-2) includes a specific *Message Type* IE, allowing the receiver to identify the general procedure and message.

Each procedure instance is identified by a *Transaction ID* IE, which is mandatory in all messages of the $eLSA_1$ protocol. The value of this IE is set by the node that initiates the procedure, and the same value shall be used by the responding node in the response message. The initiating node shall not assign this value to a new procedure during the period of execution of the original procedure.

5.4   Procedure Outcome

The node that receives the initiating message shall process the message and its IEs according to the requirements in clauses 6 and 7 and shall include in the response message an indication of whether it considers the procedure to be successful or unsuccessful.

The node that initiates the procedure shall also consider the procedure to be unsuccessful if it receives an unsuccessful indication from the receiver node. In addition, the node that initiates the procedure may consider the procedure to be unsuccessful according to criteria such as:

- lack of response message after an implementation-independent timer;

- response message indicates success, but IEs in the response message contain errors or are inconsistent with successful processing.

After a procedure failure, the action from the initiating node is generally implementation dependent, except where specified in the present document or in ETSI TS 103 652-2 [i.3].

5.5   Principles for Protocol Development and Version Interworking

The $eLSA_1$ protocol is the evolvement of the LSA_1 protocol and may be further developed in future specifications. Each new version will be distinguished by a version number. Protocol versions shall be sequentially numbered starting with V2 defined in the present document.

Table 5.5-1 provides the relationship between versions and specifications.

**Table 5.5-1: Relationship between LSA$_1$ and eLSA$_1$ protocol versions and
respective ETSI specifications**

Version Number	ETSI Specification
Version 1	ETSI TS 103 379 [i.4]
Version 2	ETSI TS 103 652-3 (the present document)

Backward compatibility between protocol versions shall not be guaranteed. A protocol peer supporting Version N of the protocol may (but is not mandated to) support lower numbered versions of the protocol (N-1, N-2, etc.).

Interworking between protocol peers is based on explicitly negotiating the protocol version to be used in the specific eLSA$_1$ instance. This negotiation takes place during the Registration procedure. During this procedure:

- The eLC provides a list of supported versions in the initial REGISTRATION REQUEST message.

- The eLR responds with the version to be used thereafter, selected from the list provided by the eLC.

In order to enable that implementations, provide support to multiple protocol versions, the following principles shall be applied concerning the development of the LSA$_1$ and eLSA$_1$ protocols:

- All messages in a particular protocol version shall be present in a higher numbered protocol version.

- All IEs in a particular message of a particular protocol version shall be present in the same message in a higher numbered protocol version.

5.6   Message Encoding and IE attributes

The message encoding is not specified in the present document.

Definitions of the messages and respective IEs are provided including presence, type and range for each IE, in order to enable translation into any particular encoding format, e.g.:

1) The presence of the IE in a message is defined as either mandatory (M), optional (O) or conditional (C). In the latter case, a condition is provided (e.g. "if the procedure is successful").

2) The type of IEs includes standard types used in abstract notation such as INTEGER and ENUMERATED.

5.7   Overview of the Protocol Specification

Clauses 6 and 7 provide the detailed specification of the eLSA$_1$ protocol.

Clause 6 documents for each procedure:

1) The format of each message in the procedure, including:

   a) List of IEs in each message.

   b) Presence of the IE in the message.

   c) Type of the IE and range (if applicable).

   d) Description of the IE.

2) The behaviour of the nodes with respect to transmission and reception of the respective messages, and in relation to the values or presence of specific IEs (including conditions under which procedures are to be considered successful or unsuccessful).

Clause 7 provides a detailed tabular representation of IEs.

6   eLSA$_1$ Protocol: Procedures and Messages

6.1   Registration procedure

6.1.1   General

The purpose of the Registration procedure is to register an eLC and VSP with an eLR.

If an eLC serves several VSPs, as illustrated in clause C.2 of ETSI TS 103 652-2 [i.3], the eLC will have a unique registration for each of the served VSPs.

This shall be the first procedure executed on the eLSA$_1$ interface. After successful competition of this procedure, the eLC can initiate requests or receive notifications on eLSRAI.
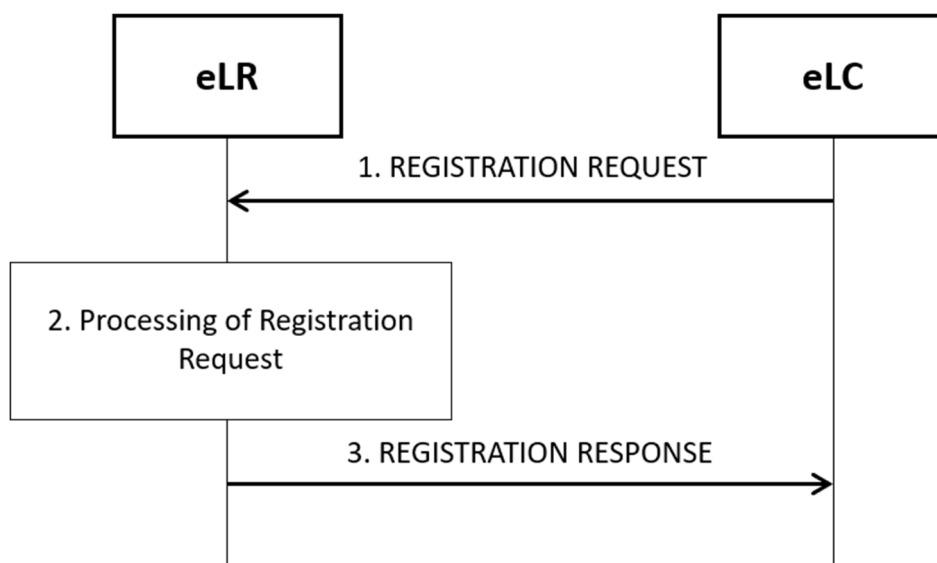
Figure 6.1.1-1: Registration Procedure

The eLC shall initiate the procedure by sending a REGISTRATION REQUEST message to the eLR. The REGISTRATION REQUEST message shall include the node identity of the eLC and the VSP identity.

Upon receiving the REGISTRATION REQUEST message, the eLR shall check the message contents, e.g. the validity of the identities. If the message check is successful and the eLR accepts the registration, it shall answer with a REGISTRATION RESPONSE message indicating successful registration. Otherwise, the eLR shall answer with a REGISTRATION RESPONSE message indicating registration failure.

In the case of successful registration, the REGISTRATION RESPONSE message shall also include an indication of how to exchange the initial eLSRAI. Following options are supported:

- Initial eLSRAI is sent via notification by the eLR.

- Initial eLSRAI is triggered by request from the eLC.

- eLR expects that eLC issues a GRANT REQUEST to request an initial eLSRAI.

After successful registration, the eLC/VSP shall remain registered during the duration of the agreed DOM periods.

The eLR shall fail the registration procedure and include an appropriate cause in the response message if:

- either the VSP ID or the eLR ID (if included) in the REGISTRATION REQUEST message are incorrect or unknown; or

- none of the versions provided by the eLC in the *Protocol Version List* IE is supported by the eLR; or

- optional plausibility test conditions are not met, e.g. eLC ID is not authorized or eLC ID cannot be used for the VSP ID, etc.

Upon successful registration, the eLR and the eLC shall store the information received from the peer node and shall consider the $eLSA_1$ interface for the VSP to be operational.

6.1.2   REGISTRATION REQUEST Message

The REGISTRATION REQUEST message shall be sent by the eLC in order to request registration from the eLR for the VSP.

The parameter list contained in the message is included in Table 6.1.2-1.

Table 6.1.2-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, initiating message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC or eLR, in a particular instance of the $eLSA_1$)
ELC ID	M	7.36	Uniquely identifies the eLC.
VSP ID	M	7.37	Uniquely identifies the VSP.
ELR ID	O	7.35	Uniquely identifies the eLR.
Protocol Version List	M	7.48	Indicates the protocol versions supported by the eLC.

6.1.3   REGISTRATION RESPONSE

The REGISTRATION RESPONSE message shall be sent by the eLR in order to respond to a REGISTRATION REQUEST message from the eLC.

The parameter list contained in the message is included in Table 6.1.3-1.

Table 6.1.3-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, response message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC or eLR, in a particular instance of the $eLSA_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
VSP ID	M	7.37	Uniquely identifies the VSP.
ELR ID	O	7.35	Uniquely identifies the eLR.
Result	M	7.41	Indicates success or failure of the registration request.
Initial procedure Indicator	C (if Result indicates success)	ENUMERATED {eLR-Initiated, eLC-Initiated}	Indicates whether a preconfigured initial eLSRAI is sent via notification by eLR or triggered by request from eLC.
Protocol Version List	C (if Result indicates success)	7.48	Indicates the protocol versions supported by the eLC.
Cause	O	7.45	Indicates cause of registration failure.

6.2   Deregistration Procedure

6.2.1   General

The Deregistration procedure shall be initiated by the eLC. The purpose of this procedure is to allow an eLC and VSP to deregister with an eLR. After successful completion of this procedure, the VSP is deregistered. When the last VSP is deregistered, the eLC can close its connectivity with the eLR. To re-establish the dialogue with an eLR, the eLC shall proceed with a Registration procedure (clause 6.1).

NOTE: It is possible to deregister all VSPs in the eLC with the eLR using a single message/procedure.
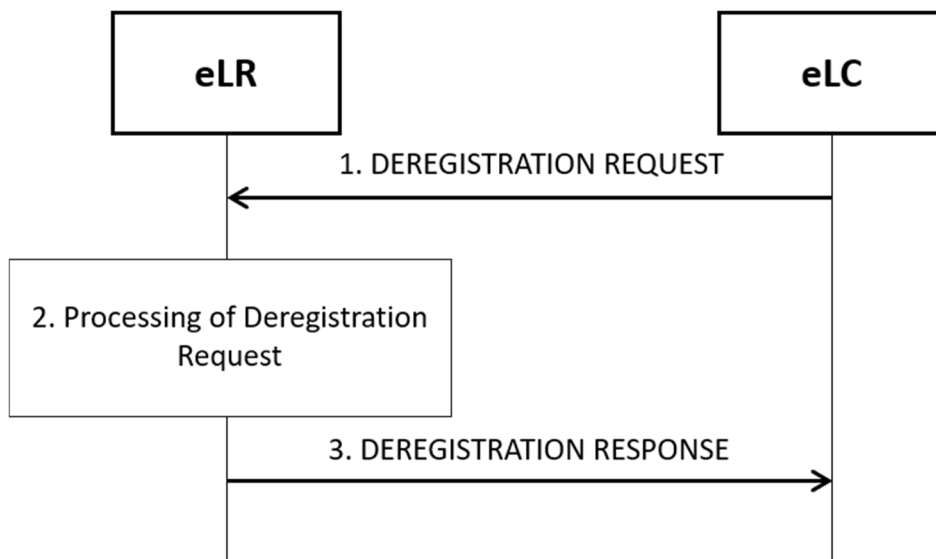
Figure 6.2.1-1: Deregistration Procedure

The eLC shall initiate the procedure by sending a DEREGISTRATION REQUEST message, optionally including a cause value, to the eLR. Upon receiving the DEREGISTRATION REQUEST message, the eLR shall check the message contents.

If the message is checked successful, the eLR shall accept the request and send a DEREGISTRATION RESPONSE message to the eLC indicating successful deregistration, otherwise it shall answer with a DEREGISTRATION RESPONSE message indicating deregistration failure.

Upon successful deregistration of the VSP:

- The eLR shall remove the VSP from the list of registered VSPs.

- The eLC shall consider that stored eLSRAI (previously received from the eLR) for this VSP as not valid.

Upon successful deregistration of all registered VSPs, the eLR and the eLC shall consider that the eLSA1 interface is no longer operational and:

- The eLR shall remove the eLC from the list of registered eLCs.

- The eLC shall consider that stored eLSRAI (previously received from the eLR) is not valid.

Depending on the conditions stated in the sharing conditions or sharing arrangements, the eLC may fall back to a pre-determined operational state after deregistration is complete.

6.2.2   DEREGISTRATION REQUEST Message

This message shall be sent by the eLC in order to request deregistration of an VSP and/or an eLC from the eLR.

The parameter list contained in the message is included in Table 6.2.2-1.

Table 6.2.2-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, initiating message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC or eLR, in a particular instance of the eLSA$_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
VSP ID	M	7.37	Uniquely identifies the VSP or all VSPs.
ELR ID	M	7.35	Uniquely identifies the eLR.
Cause	O	7.45	Provides information on the cause of the request.

6.2.3 DEREGISTRATION RESPONSE Message

This message shall be sent by the eLR in order to respond to a DEREGISTRATION REQUEST message from the eLC.

The parameter list contained in the message is included in Table 6.2.3-1.

Table 6.2.3-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, response message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC or eLR, in a particular instance of the eLSA$_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
VSP ID	M	7.37	Uniquely identifies the VSP.
ELR ID	M	7.35	Uniquely identifies the eLR.
Result	M	7.41	Indicates success or failure of the deregistration request.
Cause	O	7.45	Provides information on the cause of the deregistration failure.

6.3 eLSR Grant Procedure

6.3.1 General

The eLSR Grant procedure shall be initiated by the eLC. The purpose of this procedure is to enable the eLC to request a grant for an eLSR for a VSP. The grant is provided as eLSRAI including *Allowance Zone* information. Each eLSRAI shall contain (be associated to) a license/lease ID (L-ID).

The procedure shall be used to synchronize eLSRAI between eLR and eLC for the eLSA supported spectrum access schemes.

Figure 6.3.1-1: eLSR Grant Procedure

The eLC shall initiate the procedure by sending an eLSR GRANT REQUEST message to the eLR. Upon receiving the eLSR GRANT REQUEST message, the eLR shall check the consistency of the message contents.

If the message is checked successful, the eLR shall mark respective eLSR as granted and build the relevant eLSRAI including *Allowance Zone* IE and provide the license/lease identity (L-ID) for the eLSRAI. Then, the eLR shall send an eLSR GRANT RESPONSE message to the eLC including the eLSRAI and L-ID.

6.3.2   eLSR GRANT REQUEST Message

This message shall be sent by the eLC in order to request a grant for an eLSR for an VSP.

The parameter list contained in the message is illustrated in Table 6.3.2-1.

Table 6.3.2-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, initiating message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC or eLR, in a particular instance of the eLSA$_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	M	7.37	Uniquely identifies the VSP.
Maximum TRP	O	INTEGER (-512 to 510)	The requested maximum TRP in dBm.
Maximum EIRP	O	INTEGER (-512 to 510)	The requested maximum EIRP in dBm.
Space	M	7.9	The requested geographical area of the allowance zone.
Time	M	7.10	The requested duration of the Grant.
Grant BW	M	7.6	The requested bandwidth. The requested bandwidth needs to be allocated within the same frequency band. See note.
Contiguous Allocation	M	ENUMERATED (Contiguous, Non-contiguous)	Indicates if the frequency allocation shall be contiguous within a frequency band.
Frequency Blocks	M	7.7	Identifies frequency blocks that are possible for a frequency assignment. They are given in priority order.
Mode of Operation	M	7.39	Indicates if the DOM is requested.
NOTE: A frequency band is equal to a band defined and supported in applicable radio interface specifications such as ETSI TS 138 101 [i.5] or defined in similar ways or regulatory sharing framework. A frequency block may be a subset of a frequency band. In this specification one license is given for a specific frequency band.			

6.3.3 eLSR GRANT RESPONSE Message

This message shall be sent by the eLR in order to respond to an eLSR GRANT REQUEST message.

The parameter list contained in the message is illustrated in Table 6.3.3-1.

Table 6.3.3-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, response message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC or eLR, in a particular instance of the $eLSA_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	M	7.37	Uniquely identifies the VSP.
Result	M	7.41	Indicates success or failure of the eLSR Grant request regarding the specific Grant The result may also be "failure but with alternatives".
L-ID	C	7.38	The identity of the license/lease as described in the eLSRAI.
ELSRAI	C	7.1	Spectrum range, allowance zone, validity time, maximum allowed field strength level at border, mode of operation, etc. See note.
Cause	O	7.45	Cause of failure (maybe with some possible alternatives of possible allocations).
Cause Details	O	7.46	What spectrum resources are available for the requested Allowance Zone.
NOTE: The eLSRAI may include e.g. associated information resulting in immediate, delayed or periodic actions.			

6.4 eLSR Grant Relinquishment Procedure

6.4.1 General

The eLSR Grant Relinquishment procedure shall be initiated by the eLC. The purpose of this procedure is to enable the eLC to relinquish grants for eLSR of an VSP. The procedure shall be used to release a granted eLSR before the grant time expires.
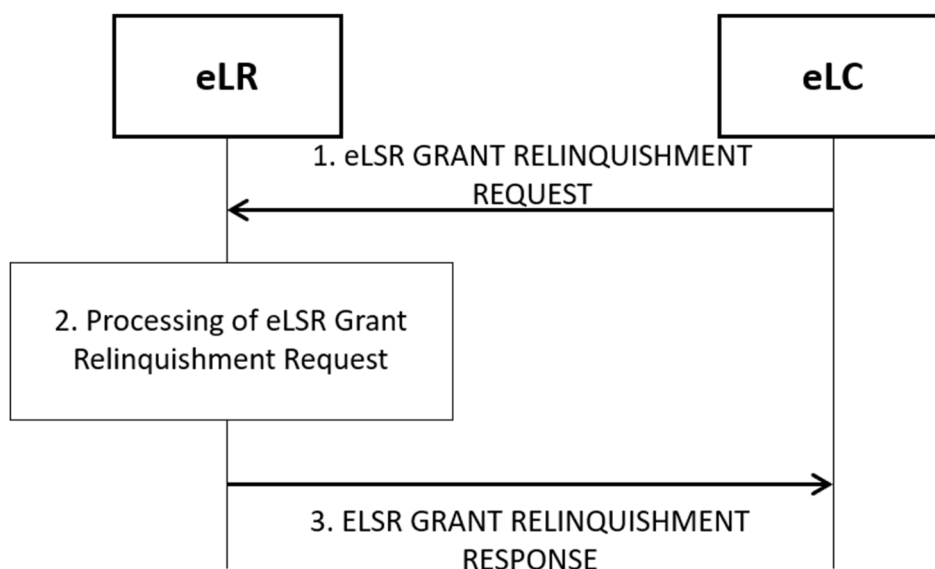
Figure 6.4.1-1: eLSR Grant Relinquishment Request Procedure
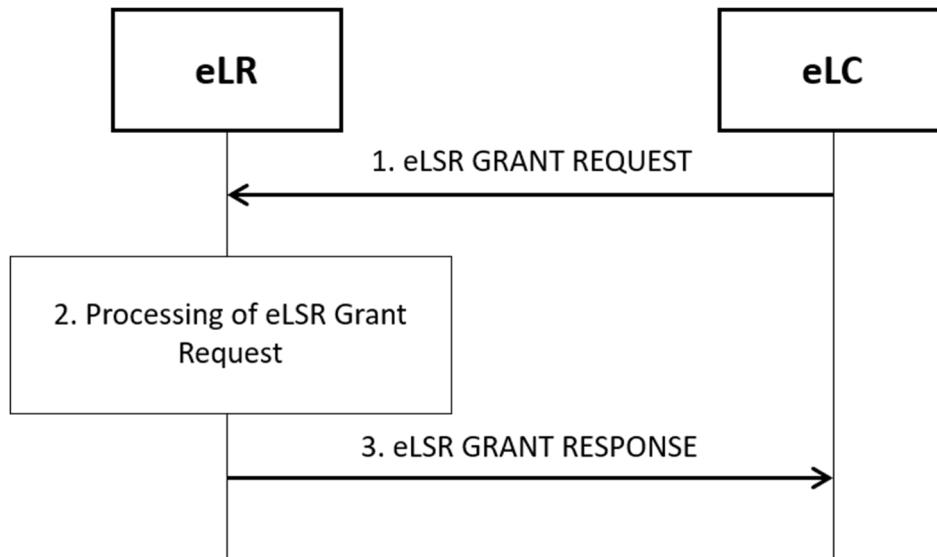
The eLC shall initiate the procedure by sending an eLSR GRANT RELINQUISHMENT REQUEST message to the eLR.

Upon receiving the eLSR GRANT RELINQUESHMENT REQUEST message, the eLR shall check the consistency of the message contents.

If the message is checked successful, the eLR shall release the eLSR associated to a certain L-Id of the VSP.

The eLR shall send an eLSR GRANT RELINQUESHMENT RESPONSE message including information on the current eLSRAI, such as spectrum, geographical area and timing and respective restrictions. The eLSRAI may include e.g. associated information resulting in immediate, delayed or periodic actions.

6.4.2 eLSR GRANT RELINQUISHMENT REQUEST Message

This message shall be sent by the eLC in order to relinquish a grant for an eLSR for an VSP.

The parameter list contained in the message is illustrated in Table 6.4.2-1.

Table 6.4.2-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, initiating message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC or eLR, in a particular instance of the $eLSA_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	M	7.37	Uniquely identifies the VSP.
L-ID	M	7.38	The identity of the license/lease as described in the eLSRAI.

6.4.3 eLSR GRANT RELINQUISHMENT RESPONSE Message

This message shall be sent by the eLR in order to respond to an eLSR GRANT RELINQUISHMENT REQUEST message.

The parameter list contained in the message is illustrated in Table 6.4.3-1.

Table 6.4.3-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, initiating message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC or eLR, in a particular instance of the $eLSA_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	M	7.37	Uniquely identifies the VSP.
L-ID	M	7.38	The identity of the license/lease as described in the eLSRAI.
Cause	O	7.45	Cause of failure.

6.5 eLSRAI Request Procedure

6.5.1 General

The purpose of the eLSRAI Request procedure is to enable the eLC to request the eLR to convey eLSRAI for an VSP.
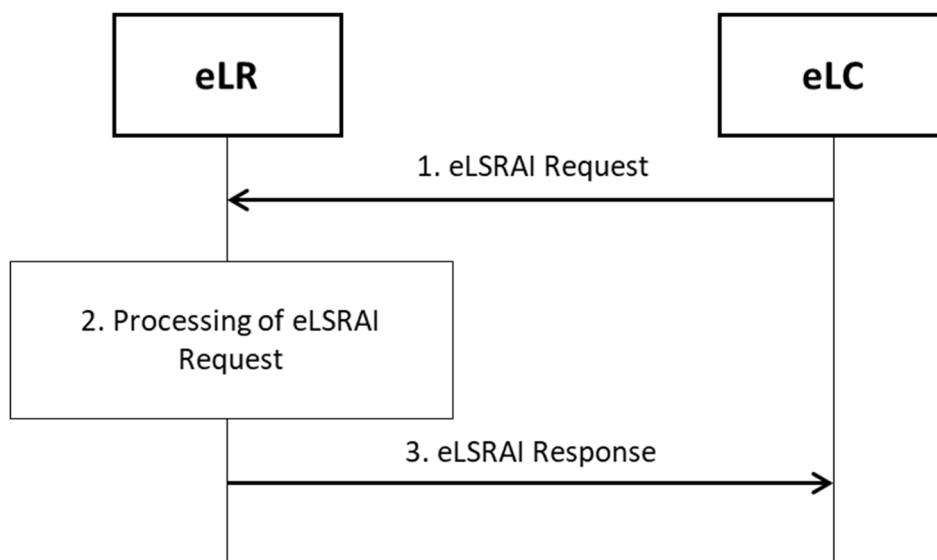
Figure 6.5.1-1: eLSRAI Request procedure

The eLC shall initiate the procedure by sending an eLSRAI REQUEST message to the eLR.

Upon receiving the eLSRAI REQUEST message, the eLR shall check the contents of the message. The eLR shall fail the eLSRAI Request procedure if either the e*LC ID*, e*LR ID, VSP_ID, or L-ID* IEs in the eLSRAI REQUEST message are incorrect or unknown.

If no *VSP ID* and *L-ID* IEs are included in the eLSRAI REQUEST message, the eLSRAI procedure shall be used for all eLSRAIs belonging to the eLC.

If only the *VSP ID IE,* but not the L-ID IE, is included in the eLSRAI REQUEST message, the eLSRAI procedure shall be used only for the eLSRAI(s) belonging to the included VSP ID.

If the *VSP ID* and *L-ID* IEs are included in the eLSRAI REQUEST message, the eLSRAI procedure shall be used only for the eLSRAI belonging to the included VSP ID and L-ID.

If the *Request Type* IE is set to "Full Synchronization" or "Full Synchronization with Reset", the eLR shall send an eLSRAI RESPONSE message to the eLC and shall not include the *eLSRAI* IE in this message. The eLR should subsequently initiate a number N of eLSRAI Notification procedures to convey the eLSRAI Context (where N ≥ 1).

> NOTE: It is up to the eLR whether to perform such segmentation.

If the *Request Type* IE is set to "Delta eLSRAI", the eLR proceeds according to clause 5.6.6 of ETSI TS 103 652-2 [i.3], and in particular, it shall send a eLSRAI RESPONSE message to the eLC, optionally including either the *Response Indicator* IE or the e*LSRAI* IE. If the e*LSRAI* IE is included, the eLC shall update the eLSRAI context accordingly. If the *Response Indicator* IE is included in the response message and set to "eLR-initiated transmission", the eLC shall be prepared to receive eLSRAI in future eLR-initiated procedure(s). If neither the e*LSRAI* IE nor the *Response Indicator* IE are included in the response message, the eLC shall consider that no update of the eLSRAI context is necessary.

6.5.2   eLSRAI REQUEST

This message shall be sent by the eLC in order to request eLSRAI from the eLR.

The parameter list contained in the message is as follows.

Table 6.5.2-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, initiating message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC, or eLR, in a particular instance of the eLSA$_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	M	7.37	Uniquely identifies the VSP.
L-ID	M	7.38	The identity of the license/lease as described in the eLSRAI.
Request Type	M	ENUMERATED (Full Synchronization, Full Synchronization with Reset, Delta eLSRAI)	The type of request. "Full Synchronization" is a request for the eLSRAI context. "Full Synchronization with Reset" is a request for the eLSRAI context which shall erase the existing context and trigger confirmations of all zones. "Delta eLSRAI" is a request for zones (or zone configurations) that have not been sent (or successfully sent) to the eLC.

6.5.3   eLSRAI RESPONSE

This message shall be sent by the eLR in order to respond to an eLSRAI REQUEST message from the eLC.

The parameter list contained in the message is as follows.

Table 6.5.3-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, response message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC, or eLR, in a particular instance of the eLSA$_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	M	7.37	Uniquely identifies the VSP.
L-ID	M	7.38	The identity of the license/lease as described in the eLSRAI.
Result	M	7.41	Indicates success or failure of the notification.
Cause	C (if request result indicates failure)	7.45	Indicates cause of eLSRAI Request failure (e.g. "unknown or incorrect eLR", "unknown or incorrect eLC", "unknown or incorrect VSP", "unknown or incorrect L-ID", synchronization process ongoing", etc.).
ELSRAI	O	7.1	Identifies the eLSRAI information element. This IE shall not be included if the Request Type IE is set to "Full Synchronization" or "Full Synchronization with Reset", or if the Response Indicator IE is included in the eLSRAI RESPONSE message.
Response Indicator	O	ENUMERATED (eLR-initiated transmission)	This IE indicates whether the eLR will initiate an eLSRAI Notification procedure(s) for eLSRAI transmission. This IE shall not be included if the Request Type IE is set to "Full Synchronization" or to "Full Synchronization with Reset", or if the eLSRAI IE is included in the eLSRAI RESPONSE message.

6.6   eLSRAI Notification Procedure

6.6.1   General

The purpose of the eLSRAI Notification procedure is to enable the eLR to convey eLSRAI to the eLC for a L-Id of a VSP.
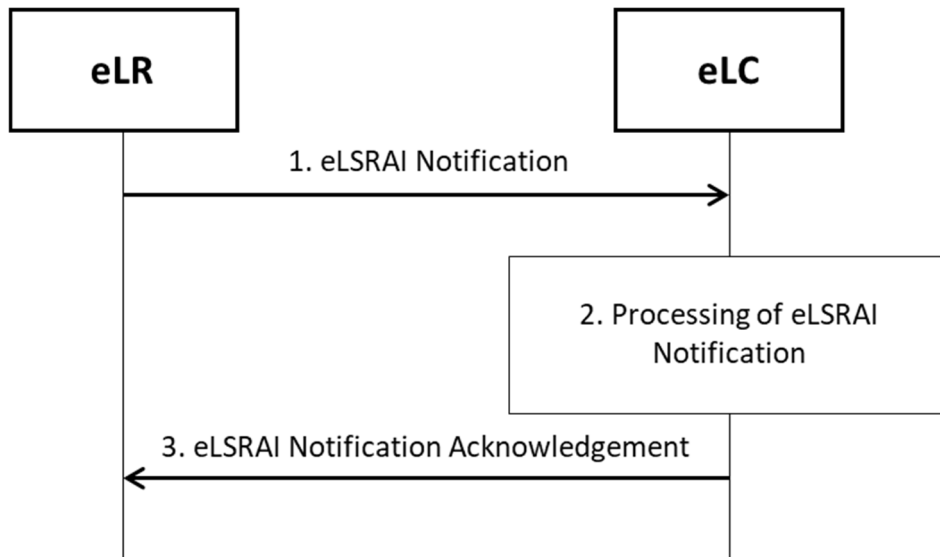
Figure 6.6.1-1: eLSRAI Notification Procedure

The eLR shall initiate the procedure by sending an eLSRAI NOTIFICATION message to the eLC.

Upon receiving the eLSRAI NOTIFICATION message, the eLC shall check the contents of the message, store the received eLSRAI, and send a eLSRAI NOTIFICATION ACK message indicating successful reception of the message including the eLSRAI; otherwise it shall ignore the received eLSRAI and answer with a eLSRAI NOTIFICATION ACK message indicating unsuccessful reception.

The eLC shall fail the eLSRAI Notification procedure if either the *eLC ID*, *eLR ID*, *VSP ID or L-ID* IEs in the eLSRAI NOTIFICATION message are incorrect or unknown, or if any of the zone definitions in the *eLSRAI* IE is invalid or cannot be understood by the eLC.

The eLC shall process the zone definitions irrespective of whether or not it controls resources impacted by the corresponding zones.

If the *Synchronization Information* IE is included in the eLSRAI NOTIFICATION message, the eLC shall:

- ignore the *Zone Action* IE contained in the *eLSRAI* IE;

- use the eLSRAI included to construct the eLSRAI context, together with eLSRAI received in other messages/procedures, if applicable; and

- provide the corresponding *Synchronization Ack Information* IE in the eLSRAI NOTIFICATION ACK message.

If the *Reset Indicator* IE is included in the *Synchronization Information* IE, the eLC shall replace the existing eLSRAI context with the newly received one, and assume that all zones in the eLSRAI context require confirmation.

6.6.2   eLSRAI NOTIFICATION

This message shall be sent by the eLR in order to convey eLSRAI to the eLC.

The parameter list contained in the message is as follows.

Table 6.6.2-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, initiating message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC, or eLR, in a particular instance of the $eLSA_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	M	7.37	Uniquely identifies the VSP.
L-ID	M	7.38	The identity of the license/lease as described in the eLSRAI.
ELSRAI	M	7.1	Identifies the eLSRAI information element.

6.6.3 eLSRAI NOTIFICATION ACK

This message shall be sent by the eLC in order to respond to an eLSRAI NOTIFICATION message from the eLR.

The parameter list contained in the message is as follows.

Table 6.6.3-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, response message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC, or eLR, in a particular instance of the $eLSA_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	M	7.37	Uniquely identifies the VSP.
L-ID	M	7.38	The identity of the license/lease as described in the eLSRAI.
Result	M	7.41	Indicates success or failure of the notification.
Cause	C (if notification result indicates failure)	7.45	Indicates cause of eLSRAI notification failure (e.g. "unknown or incorrect eLR", "unknown or incorrect eLC", "unknown or incorrect VSP", "unknown or incorrect L-ID", "Incomplete zone parameters", etc.).
Synchronization ACKInformation	O	7.12	Provides acknowledgment information related to the ongoing synchronization process.

6.7 eLSRAI Confirmation Procedure

6.7.1 General

The purpose of the eLSRAI Confirmation procedure is to enable the eLC to notify the eLR that configuration changes in the MFCN (if needed) have been applied according to previously received eLSRAI.
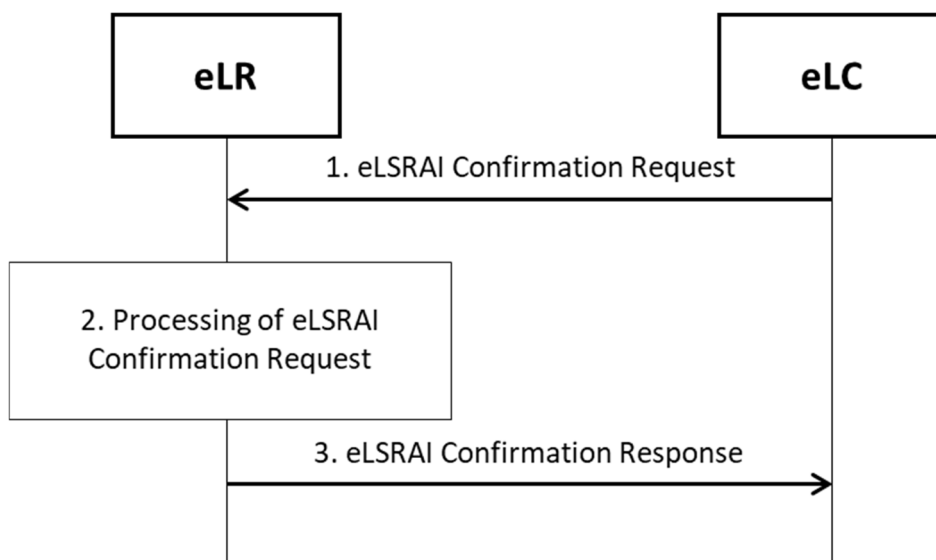
Figure 6.7.1-1: eLSRAI Confirmation Procedure

The eLC shall initiate the procedure by sending an eLSRAI CONFIRMATION REQUEST message to the eLR. The message shall include a list of Zone Identities corresponding to the zones that are being confirmed, and including, for each zone, the respective Zone Configuration Index.

NOTE: Successful confirmation by the eLC implies that each of the identified Zones is being complied with by the eLC, and any MFCN resources associated with the eLC.

Upon receiving the eLSRAI CONFIRMATION REQUEST message, the eLR shall check the contents of the message, store the received confirmations, and send a eLSRAI CONFIRMATION RESPONSE message indicating successful reception of the message, including the confirmation information; otherwise it shall answer with a eLSRAI CONFIRMATION RESPONSE message indicating unsuccessful reception.

The eLR shall fail the eLSRAI Confirmation procedure if either the *eLC ID*, *eLR* ID, *VSP ID* or *L-ID* IEs in the eLSRAI CONFIRMATION REQUEST message are incorrect or unknown, or the eLR detects inconsistencies in the eLSRAI CONFIRMATION REQUEST message.

6.7.2   eLSRAI CONFIRMATION REQUEST

This message shall be sent by the eLC in order to notify the eLR about processed configuration changes for a zone or zones.

The parameter list contained in the message is as follows.

Table 6.7.2-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, initiating message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC, or eLR, in a particular instance of the $eLSA_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	M	7.37	Uniquely identifies the VSP.
L-ID	M	7.38	The identity of the license/lease as described in the eLSRAI.
Confirmed Zone List	M	7.30	Includes the list of zones to be confirmed.
$ELSA_1$ Availability in DOM	O	7.40	eLC request activation or deactivation of DOM on $eLSA_1$.

6.7.3 eLSRAI CONFIRMATION RESPONSE

This message shall be sent by the eLR in order to respond to an eLSRAI CONFIRMATION REQUEST message from the eLC.

The parameter list contained in the message is as follows.

Table 6.7.3-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, response message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC, or eLR, in a particular instance of the $eLSA_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	M	7.37	Uniquely identifies the VSP.
L-ID	M	7.38	The identity of the license/lease as described in the eLSRAI.
eLSA1 Availability in DOM	O	7.40	Indicates conformity of eLR with the requested $eLSA_1$ activation or deactivation.
Result	M	7.41	Indicates success or failure of the confirmation.
Cause	C (if confirmation result indicates failure)	7.45	Indicates cause of eLSRAI confirmation failure (e.g. "unknown or incorrect eLR", "unknown or incorrect eLC", "unknown or incorrect VSP", "incorrect parameters for confirmed zone", etc.).

6.8 Connectivity Check Notification Procedure

6.8.1 General

The purpose of the Connectivity Check Notification procedure is to enable the eLR to test the connectivity with a registered eLC.

Figure 6.8.1-1: Connectivity Check Notification Procedure

The eLR shall initiate the procedure by sending a CONNECTIVITY CHECK NOTIFICATION message to the eLC.

Upon receiving the CONNECTIVITY CHECK NOTIFICATION message, the eLC shall check the message contents. The eLC shall fail the Connectivity Check Notification procedure if either the *eLC ID, eLR ID, VSP ID, or L-ID* IEs in the CONNECTIVITY CHECK NOTIFICATION message are incorrect or unknown, and shall answer with a CONNECTIVITY CHECK NOTIFICATION ACK message indicating unsuccessful reception.

If the message includes the *Sync Zone List* IE related to the license or lease identified by the L-ID, the eLC shall compare the contents of this IE to the locally stored eLSRAI context of the L-ID. If the IE matches the local context, and the message check is successful, the eLC shall answer with a CONNECTIVITY CHECK NOTIFICATION ACK message indicating successful reception of the message, otherwise it shall answer with a CONNECTIVITY CHECK NOTIFICATION ACK message indicating unsuccessful reception, and including an appropriate cause value.

6.8.2 CONNECTIVITY CHECK NOTIFICATION

This message shall be sent by the eLR in order to initiate a connectivity check with the eLC.

The parameter list contained in the message is as follows.

Table 6.8.2-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, initiating message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC, or eLR, in a particular instance of the $eLSA_1$).
EeLC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	O	7.37	Uniquely identifies the VSP.
L-ID	O	7.38	The identity of the license/lease as described in the eLSRAI.
Sync Zone List	O	7.43	Full list of zones in the eLR's eLSRAI Context.
Cause	O	7.45	Indicates cause of connectivity check.

6.8.3 CONNECTIVITY CHECK NOTIFICATION ACK

This message shall be sent by the eLC in order to respond to a CONNECTIVITY CHECK NOTIFICATION message from the eLR.

The parameter list contained in the message is as follows.

Table 6.8.3-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, response message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC, or eLR, in a particular instance of the $eLSA_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	O	7.37	Uniquely identifies the VSP.
L-ID	O	7.38	The identity of the license/lease as described in the eLSRAI.
Result	M	7.41	Indicates success or failure of the connectivity request.
Cause	O	7.45	Indicates cause of connectivity failure.

6.9 Connectivity Check Request Procedure

6.9.1 General

The purpose of the Connectivity Check Request procedure is to enable the eLC to test the connectivity with the eLR with which it is registered.
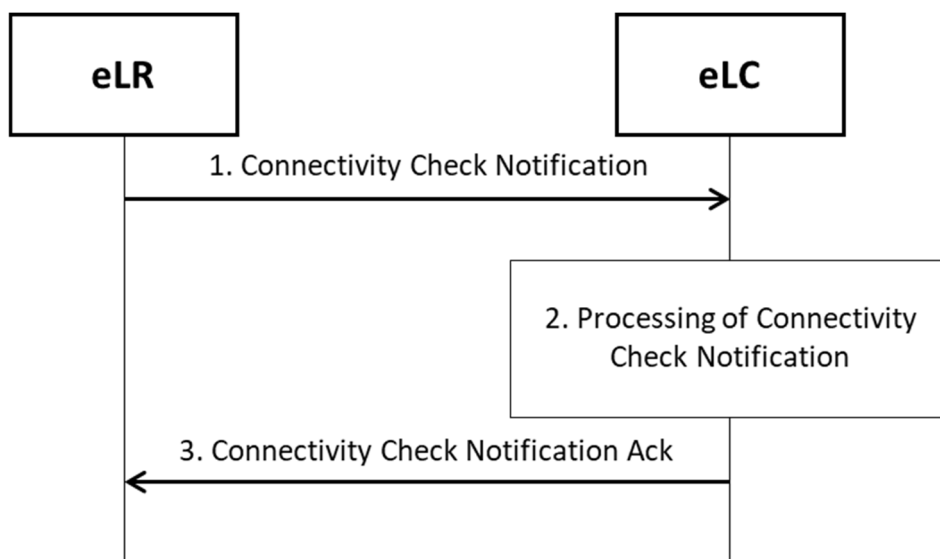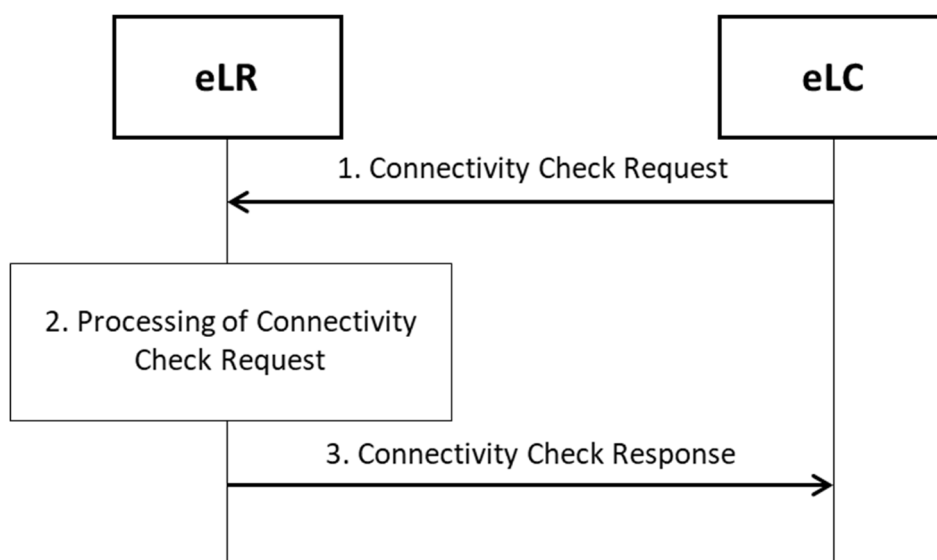
Figure 6.9.1-1: Connectivity Check Request Procedure

The eLC shall initiate the procedure by sending a CONNECTIVITY CHECK REQUEST message to the eLR. The eLR shall fail the Connectivity Check Request procedure if either the *eLC ID, eLR ID, VSP ID, or L-ID* IEs in the CONNECTIVITY CHECK REQUEST message are incorrect or unknown and shall answer with a CONNECTIVITY CHECK RESPONSE message indicating unsuccessful reception.

If the message includes the *Sync Zone List* IE related to the license or lease identified by the L-ID, the eLR shall compare the contents of this IE to the locally stored eLSRAI context of the L-ID. If the IE matches the local context and the message check is successful, the eLR shall answer with a CONNECTIVITY CHECK RESPONSE message indicating successful reception of the message, otherwise it shall answer with a CONNECTIVITY CHECK RESPONSE message indicating unsuccessful reception, and including an appropriate cause value.

6.9.2 CONNECTIVITY CHECK REQUEST

This message shall be sent by the eLC in order to initiate a connectivity check with the eLR.

The parameter list contained in the message is as follows.

Table 6.9.2-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, initiating message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC, or eLR, in a particular instance of the $eLSA_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	O	7.37	Uniquely identifies the VSP.
L-ID	O	7.38	The identity of the license/lease as described in the eLSRAI.
Sync Zone List	O	7.43	Full list of zones in the eLC's eLSRAI Context.
Cause	O	7.45	Indicates cause of connectivity check request.

6.9.3 CONNECTIVITY CHECK RESPONSE

This message shall be sent by the eLR in order to respond to a CONNECTIVITY CHECK REQUEST message from the eLC.

The parameter list contained in the message is as follows.

Table 6.9.3-1

Name	Presence	Type or reference	Description
Message Type	M	7.33	Identifies the message type (procedure code, response message).
Transaction ID	M	7.34	Uniquely identifies the transaction (shall be unique for all ongoing procedures initiated by eLC, or eLR, in a particular instance of the $eLSA_1$).
ELC ID	M	7.36	Uniquely identifies the eLC.
ELR ID	M	7.35	Uniquely identifies the eLR.
VSP ID	O	7.37	Uniquely identifies the VSP.
L-ID	O	7.38	The identity of the license/lease as described in the eLSRAI.
Result	M	7.41	Indicates success or failure of the connectivity request.
Cause	O	7.45	Indicates cause of connectivity failure.

7   eLSA1 Protocol: Information Elements

7.1   ELSRAI

The E*LSRAI* IE is used to convey zone descriptions (i.e. exclusion zones, restriction zones, protection zones and allowance zones).

Table 7.1-1

Name	Presence	Type or reference	Description
Number of zones	M	INTEGER (0 to 1 023)	Identifies the number of zones N included in the eLSRAI IE. If set to "0", it indicates that the following IEs should not be included, and if included, shall be ignored.
Zone Description (zone 1)	O	7.2	Includes zone parameters for zone 1.
Zone Description (zone 2)	O	7.2	Includes zone parameters for zone 2.
…	…	…	…
Zone Description (zone N)	O	7.2	Includes zone parameters for zone N.

7.2   Zone Description

The *Zone Description* IE contains information about the parameters of a zone.

If the *Zone Action* IE is set to "Create", the *Frequency*, *Radio Constraints*, *Space* and *Time* IEs shall be included in the *Zone Description* IE, except in the case of exclusion zones (*Zone Type* IE set to "0"), for which the *Radio Constraints* IE should be omitted.

If the *Zone Action* IE is set to "Modify", at least one of the *Frequency*, *Radio Constraints*, *Space* and *Time* IEs shall be included in the *Zone Description* IE.

If the *Zone Action* IE is set to "Delete", all parameters apart from *Zone ID* shall be ignored by the eLC.

Table 7.2-1

Name	Presence	Type or reference	Description
Zone ID	M	7.47	Identifies the zone ID.
Zone Configuration Index	M	7.32	Identifies the configuration of the zone. The configuration index is set by the eLR, and should be changed (from the previous value) if the Zone Action IE is set to "Modify".
Zone Type	M	7.3	Identifies the zone type. The Zone Type IE is a static zone parameter which cannot be changed (i.e. when the Zone Action IE is set to "Modify").
Zone Action	M	7.4	Identifies the action for the zone. The Zone Action IE should be ignored if the Zone Description IE is contained within a eLSRAI NOTIFICATION message which is part of a synchronization process.
Frequency	O	7.5	Includes the frequency range of the zone.
Radio Constraints	O	7.8	Identifies zone type specific radio constraints.
Space	O	7.9	Includes geographic information about the zone.
Time	O	7.10	Includes time information about the zone.
Mode of Operation	O	7.39	Identify the mode of operation of the $eLSA_1$ for the eLSRAI.

NOTE: When an L-Id is associated to a frequency allocation comprising more than one non-contiguous frequency blocks, a Zone Description IE is required for defining each frequency block.

7.3   Zone Type

The *Zone Type* IE contains information about the zone type.

Table 7.3-1

Name	Presence	Type or reference	Description
Zone Type	M	INTEGER (0 to 255)	The following values shall be used: "0" - Exclusion Zone. "1" - Restriction Zone. "2" - Protection Zone. "3" - Allowance Zone. Other values are reserved for future use.

7.4   Zone Action

The *Zone Action* IE contains information about the action to be performed on the zone.

Table 7.4-1

Name	Presence	Type or reference	Description
Zone Action	M	INTEGER (0 to 7)	The following values shall be used: "0" - Create (zone does not exist and is to be created). "1" - Modify (zone exists and some of its parameters are to be modified). "2" - Delete (zone is to be deleted).

7.5   Frequency

The *Frequency* IE contains information about the frequency span within which the zone constraints should be applied.

NOTE 1: It may span over more than one frequency block (7.7), all belonging to the same frequency band.

NOTE 2: All frequency blocks in a zone description belong to the same frequency band (as defined in Sharing Framework).

Table 7.5-1

Name	Presence	Type or reference	Description
Lower frequency	M	7.18	Zone applies to frequencies above the signalled value.
Upper frequency	M	7.18	Zone applies to frequencies below the signalled value.

7.6   Grant BW

The *Grant BW* IE contains information about the requested bandwidth.

Table 7.6-1

Name	Presence	Type or reference	Description
Bandwidth	M	INTEGER (1 to 16 384)	The IE value (N) is equal to the bandwidth in MHz.

7.7   Frequency Blocks

The *Frequency blocks* IE contains a list of frequency blocks each identified with a starting frequency and an ending frequency.

Table 7.7-1

Name	Presence	Type or reference	Description
Number of Lower and Upper frequency instances	M	INTEGER (0 to 256)	Identifies the number N of upper and lower frequencies.
Lower frequency 1	M	7.18	Lower starting point of frequency block 1.
Upper frequency 1	M	7.18	Upper ending point of frequency block 1.
Lower frequency 2	O	7.18	Lower starting point of frequency block 2.
Upper frequency 2	O	7.18	Upper ending point of frequency block 2.
…	…	…	…
Lower frequency N-1	O	7.18	Lower starting point of frequency block N-1.
Upper frequency N-1	O	7.18	Upper ending point of frequency block N-1.
Lower frequency N	O	7.18	Lower starting point of frequency block N.
Upper frequency N	O	7.18	Upper ending point of frequency block N.

7.8   Radio Constraints

7.8.1   Introduction

The *Radio Constraints* IE contains information on the radio constraints that need be satisfied by the MFCN, for a given zone.

7.8.2   Radio Constraints parameters

This clause describes the parameters that can be used to define radio constraints of a zone.

Table 7.8.2-1

Name	Presence	Type or reference	Description
Radio Constraints Profile identifier	M	INTEGER (0 to 1 023)	Uniquely identifies a Radio Constraints Profile. For each Radio Constraints Profile, a set of mandatory and optional parameters is defined in clause 7.8.2.
Protection height above ground level	O	INTEGER (0 to 4 095)	Height above ground level, in meters, at which the radio constraints specified in this *Radio Constraints* IE should be satisfied, at every location within the zone specified in the *Space* IE.
Maximum field strength	O	INTEGER (-512 to 510)	Maximum allowed field strength (in dB microVolts/meter), at every location within the zone specified in the *Space* IE, when integrated for each *Frequency Interval,* over the bandwidth specified in *Frequency* IE.
Frequency Interval	O	INTEGER (1 to 10 000 000)	Indicates an amount of KHz.
Maximum applicable antenna height above ground level	O	INTEGER (0 to 4 095)	Maximum height above ground level, in meters, of an actively transmitting antenna up to which the EIRP restriction specified in the Radio Constraints Profile containing this parameter is applicable.
EIRP restriction	O	INTEGER (-512 to 510)	Maximum EIRP (in dBm per "*Frequency Interval*") allowed for a transmitter deployed by the MFCN at any location within the zone specified in the *Space* IE, over the bandwidth specified in *Frequency* IE.
TRP restriction	O	INTEGER (-512 to 510)	Maximum TRP (in dBm per "*Frequency Interval*") allowed for a transmitter deployed by the MFCN at any location within the zone specified in the *Space* IE, over the bandwidth specified in *Frequency* IE.
ACS	O	INTEGER (0 to 511)	Adjacent channel selectivity (in dB).
Maximum field strength at border	O	INTEGER (-512 to 510)	Maximum allowed field strength (in dBmicroVolts/meter) at every location of the border of an Allowance Zone as specified in the *Space* IE measured at the height above ground as specified in the *Field strength height* IE.
Field strength height	O	INTEGER (0 to 127)	The height above ground (in meters) at which the field strength specified in the *Maximum Field strength at border* IE is defined.

7.8.3   Radio Constraints Profiles

This clause describes, for each Radio Constraints Profile, the set of parameters that are allowed.

For a particular Zone, the Radio Constraints Profile identifier shall be consistent with the *Zone Type* IE, as specified for each identifier below.

NOTE 1: The precise usage of a radio constraints parameter, for a given Radio Constraints Profile, will be further refined outside of the present document whenever needed, as part of a Sharing Arrangement.

Radio Constraints Profile identifier = 0

This profile defines a protection zone, e.g. to be used for video PMSE as defined in section 3.2.2 of CEPT Report 58 [i.6]. This profile may be used when the *Zone Type* IE is set to "2". For this profile, the following parameters are used.

Table 7.8.3-1

Name	Presence
Protection height above ground level	M
Maximum field strength	M
Frequency Interval	M
ACS	O

NOTE 2: The ACLR, that can be used to compute the maximum allowed field strength in adjacent channel situations as described in section 3.2.2 of CEPT Report 58 [i.6], is a parameter of the MFCN and assumed to be known by the eLC. It is therefore not included as a parameter.

Radio Constraints Profile identifier = 1

This profile defines a restriction zone based on EIRP. This profile may be used when the *Zone Type* IE is set to "1". For this profile, the following parameters are used.

Table 7.8.3-2

Name	Presence
Maximum applicable antenna height above ground level	M
EIRP restriction	M
Frequency Interval	M

Radio Constraints Profile identifier = 2

This profile defines an allowance zone based on field strength at border. This profile may be used when the *Zone Type* IE is set to "3". For this profile, the following parameters are used.

Table 7.8.3-3

Name	Presence
Maximum applicable antenna height above ground level	O
EIRP restriction	O
TRP restriction	O
Frequency Interval	O
Maximum field strength at border	O
Field strength height	O

7.9   Space

The *Space* IE contains information about the space parameters of a zone. Only one of the options in table 7.7-1 may be present in a particular instance of this IE.

Table 7.9-1

Name	Presence	Type or reference	Description
Circle	O	7.13	Zone is to become operational within the defined circle area.
Circle-2	O	7.14	Zone is to become operational within the defined circle area.
Polygon	O	7.15	Zone is to become operational within the defined polygon.
Area Descriptor	O	7.16	Zone is to become operational over area associated with the Area Descriptor.

7.10   Time

The *Time* IE contains information about the time parameters of a zone. Only one of the options in table 7.8-1 may be present in a particular instance of this IE. The *Aperiodic* IE shall be used for all cases of non-periodic operation, including simple start, stop or schedules (see details in clause 7.17).

Table 7.10-1

Name	Presence	Type or reference	Description
Periodic	O	7.19	Includes periodic parameters for zone operation.
Aperiodic	O	7.20	Includes unconstrained schedule parameters for zone operation (can be used for basic start or stop commands).

7.11   Synchronization Information

The *Synchronization Information* IE contains information about an ongoing synchronization process.

Table 7.11-1

Name	Presence	Type or reference	Description
Sync ID	M	7.36	Identifies the synchronization process.
Sync Status	M	ENUMERATED (ongoing, last message)	Indicates whether further procedures will be initiated for this synchronization process.
Reset Indicator	O	ENUMERATED (reset)	Indicates whether the eLC shall perform a full eLSRAI reset as a result of this synchronization process.

7.12   Synchronization ACK Information

The *Synchronization Ack Information* IE contains acknowledgement information about an ongoing synchronization process.

Table 7.12-1

Name	Presence	Type or reference	Description
Sync ID	M	7.42	Identifies the synchronization process.
Sync Zone List	O	7.43	For each zone received as part of the synchronization process, includes the Zone ID and Zone Configuration Index. This IE shall be included if the Sync Status in the Synchronization Information IE is set to "last message".

7.13   Circle

The *Circle* IE contains the parameters defining a circle.

> NOTE: A Radius parameter set to 0 indicates that the zone consists of a single point whose location is specified by the *Centre coordinates* IE.

Table 7.13-1

Name	Presence	Type or reference	Description
Centre Coordinates	M	7.14	Geographical coordinates.
Radius	M	INTEGER (0 to 2^{23}-1)	The relation between the value (N) and the radius (r) in meters it describes is $5N \leq r < 5(N+1)$, except for $N=2^{23}$-1 for which the range is extended to include all greater values of (r).

7.14   Circle-2

The *Circle-2* IE contains the parameters defining a circle.

Table 7.14-1

Name	Presence	Type or reference	Description
Centre Coordinates	M	7.16	Geographical coordinates.
Radius	M	INTEGER (1 to 2^{23}-1)	The radius (r) in meters.

7.15   Polygon

The *Polygon* IE contains the parameters defining a polygon.

Table 7.15-1

Name	Presence	Type or reference	Description
Number of Points	M	INTEGER (3 to 15)	Identifies the number N of points in the polygon
Point 1	M	7.17	Geographical coordinates
Point 2	M	7.17	Geographical coordinates
Point 3	M	7.17	Geographical coordinates
Point 4	O	7.17	Geographical coordinates
…	…	…	…
Point N	O	7.17	Geographical coordinates

7.16   Area Descriptor

The *Area Descriptor* IE contains text strings that may be interpreted as identifying an area (e.g. postcodes, real estate identifier).

Table 7.16-1

Name	Presence	Type or reference	Description
Number of strings	M	INTEGER (1 to 1 000)	Identifies the number N of text strings in the Area Descriptor
String 1	M	PrintableString(SIZE(1 to 150))	Text string describing an area
String 2	O	PrintableString(SIZE(1 to 150))	Text string describing an area
String 3	O	PrintableString(SIZE(1 to 150))	Text string describing an area
String 4	O	PrintableString(SIZE(1 to 150))	Text string describing an area
…	…	…	…
String N	O	PrintableString(SIZE(1 to 150))	Text string describing an area

7.17   Geographical Coordinates

The *Geographical Coordinates* IE contains the geographical coordinates.

Table 7.17-1

Name	Presence	Type or reference	Description
Latitude Sign	M	ENUMERATED (North, South)	
Degrees of Latitude	M	INTEGER (0 to 2^{23}-1)	The IE value (N) is derived using this formula: $N \leq 2^{23} X /90 < N+1$ X being the latitude in degree (0° to 90°)
Degrees of Longitude	M	INTEGER (-2^{23} to 2^{23}-1)	The IE value (N) is derived by this formula: $N \leq 2^{24} X /360 < N+1$ X being the longitude in degree (-180° to +180°)

7.18   Frequency Value

The *Frequency Value* IE contains a frequency value.

Table 7.18-1

Name	Presence	Type or reference	Description
Frequency Value	M	INTEGER (0 to 10 000 000)	The IE value (N) is derived from the following formula: F = (N/10) Where F is the frequency in MHz

7.19   Periodic

The *Periodic* IE contains the times when a zone is to be operational within a period (day/week/month/year).

Table 7.19-1

Name	Presence	Type or reference	Description
CHOICE Period Length	M		
>Day			
>>Day schedule	M	7.22	One day schedule to be repeated every 24 hours
>Week			
>>Week schedule	M	7.23	One week schedule to be repeated every week
>Month			
>>Month schedule	M	7.24	One month schedule to be repeated every month
>Year			
>>Year schedule	M	7.25	One year schedule to be repeated every year

7.20   Aperiodic

The *Aperiodic* IE contains the parameters defining an unconstrained time schedule with multiple idle-operational transitions for a given zone. This structure is also used to indicate simpler operations e.g.:

- A start-only indication may be signalled by setting N to "1" and including a single Start Time.

- A stop-only indication may be signalled by setting N to "2", and including Start Time 1 and Stop Time 2, where Start Time 1 indicates a past value.

The Start and Stop Times shall be in order, i.e. Start Time 1 < Stop Time 2 < Start Time 3 < Stop Time 4 < ....

Table 7.20-1

Name	Presence	Type or reference	Description
Number of time values	M	INTEGER (1 to 1 024)	Identifies the number N of time values.
Start Time 1	M	7.21	Time value for first transition to operational.
Stop Time 2	O	7.21	Time value for first transition to idle.
Start Time 3	O	7.21	Time value for next transition to operational.
Stop Time 4	O	7.21	Time value for next transition to idle.
…	…	…	…
Start Time (N-1)	O	7.21	Time value for last transition to operational.
Stop Time N	O	7.21	Time value for last transition to idle.

7.21   Time

The *Time* IE contains date and time information. It is assumed to be based on UTC unless otherwise agreed within a deployed system.

Table 7.21-1

Name	Presence	Type or reference	Description
Year	M	INTEGER (0 to 9 999)	
Month	M	INTEGER (1 to 12)	
Date	M	INTEGER (1 to 31)	
Hour	M	INTEGER (0 to 23)	
Minute	M	INTEGER (0 to 59)	
Second	O	INTEGER (0 to 59)	

7.22   Day Schedule

The *Day Schedule* IE contains the parameters defining an unconstrained time schedule within one day (to be repeated on a daily basis).

Table 7.22-1

Name	Presence	Type or reference	Description
Number of time of day values	M	INTEGER (1 to 1 024)	Identifies the number N of time of day values.
Time of day value 1	M	7.26	Time of day value for first transition to operational.
Time of day value 2	O	7.26	Time of day value for first transition to idle.
Time of day value 3	O	7.26	Time of day value for next transition to operational.
Time of day value 4	O	7.26	Time of day value for next transition to idle.
…	…	…	…
Time of day value N-1	O	7.26	Time of day value for last transition to operational.
Time of day value N	O	7.26	Time of day value for last transition to idle.

7.23   Week Schedule

The *Week Schedule* IE contains the parameters defining an unconstrained time schedule within one week (to be repeated on a weekly basis).

Table 7.23-1

Name	Presence	Type or reference	Description
Number of time of week values	M	INTEGER (1 to 1 024)	Identifies the number N of time of week values.
Time of week value 1	M	7.27	Time of week value for first transition to operational.
Time of week value 2	O	7.27	Time of week value for first transition to idle.
Time of week value 3	O	7.27	Time of week value for next transition to operational.
Time of week value 4	O	7.27	Time of week value for next transition to idle.
…	…	…	…
Time of week value N-1	O	7.27	Time of week value for last transition to operational.
Time of week value N	O	7.27	Time of week value for last transition to idle.

7.24   Month Schedule

The Month Schedule IE contains the parameters defining an unconstrained time schedule within one month (to be repeated on a monthly basis).

Table 7.24-1

Name	Presence	Type or reference	Description
Number of time of month values	M	INTEGER (1 to 1 024)	Identifies the number N of time of month values.
Time of month value 1	M	7.28	Time of month value for first transition to operational.
Time of month value 2	O	7.28	Time of month value for first transition to idle.
Time of month value 3	O	7.28	Time of month value for next transition to operational.
Time of month value 4	O	7.28	Time of month value for next transition to idle.
…	…	…	…
Time of month value N-1	O	7.28	Time of month value for last transition to operational.
Time of month value N	O	7.28	Time of month value for last transition to idle.

7.25   Year Schedule

The *Year Schedule* IE contains the parameters defining an unconstrained time schedule within one year (to be repeated on a yearly basis).

Table 7.25-1

Name	Presence	Type or reference	Description
Number of time of year values	M	INTEGER (1 to 1 024)	Identifies the number N of time of year values.
Time of year value 1	M	7.29	Time of year value for first transition to operational.
Time of year value 2	O	7.29	Time of year value for first transition to idle.
Time of year value 3	O	7.29	Time of year value for next transition to operational.
Time of year value 4	O	7.29	Time of year value for next transition to idle.
…	…	…	…
Time of year value N-1	O	7.29	Time of year value for last transition to operational.
Time of year value N	O	7.29	Time of year value for last transition to idle.

7.26   Time of Day

The Time of Day IE contains time information within a 24 hour period.

Table 7.26-1

Name	Presence	Type or reference	Description
Hour	M	INTEGER (0 to 23)	
Minute	M	INTEGER (0 to 59)	
Second	O	INTEGER (0 to 59)	

7.27   Time of Week

The *Time of Week* IE contains time information within a 7 day period.

Table 7.27-1

Name	Presence	Type or reference	Description
Day	M	INTEGER (1 to 7)	Value "1" represents Monday.
Hour	M	INTEGER (0 to 23)	
Minute	M	INTEGER (0 to 59)	
Second	O	INTEGER (0 to 59)	

7.28   Time of Month

The *Time of Month* IE contains time information within a month's period. Any events occurring after month end in a particular month (e.g. on the 30th day of February) are deemed to happen on the last minute of the month.

Table 7.28-1

Name	Presence	Type or reference	Description
Date	M	INTEGER (1 to 31)	
Hour	M	INTEGER (0 to 23)	
Minute	M	INTEGER (0 to 59)	
Second	O	INTEGER (0 to 59)	

7.29   Time of Year

The *Time of Year* IE contains time information within a year's period.

Table 7.29-1

Name	Presence	Type or reference	Description
Month	M	INTEGER (1 to 12)	
Date	M	INTEGER (1 to 31)	
Hour	M	INTEGER (0 to 23)	
Minute	M	INTEGER (0 to 59)	
Second	O	INTEGER (0 to 59)	

7.30   Confirmed Zone List

The *Confirmed Zone List* IE contains a list of Zone confirmations.

Table 7.30-1

Name	Presence	Type or reference	Description
Number of Zones	M	INTEGER (1 to 1 024)	Identifies the number of zones N in the Confirmed Zone List IE.
Zone Confirmation 1	M	7.31	Confirmation information for first zone.
Zone Confirmation 2	O	7.31	Confirmation information for second zone.
…	…	…	…
Zone Confirmation N	O	7.31	Confirmation information for the nth zone.

7.31   Zone Confirmation

The *Zone Confirmation* IE contains the Zone ID and Configuration Index of a zone to be confirmed, and associated confirmation information.

Table 7.31-1

Name	Presence	Type or reference	Description
Zone ID	M	7.47	Identifies the zone ID.
Zone Configuration Index	M	7.32	Identifies the specific configuration of the zone that is being confirmed.
ELC Confirmation Status	M	ENUMERATED (successful confirmation, confirmation not possible)	Provides the confirmation status at the eLC.

7.32   Zone Configuration Index

The *Zone Configuration Index* IE contains the Zone Configuration Index of a zone.

Table 7.32-1

Name	Presence	Type or reference	Description
Zone Configuration Index	M	INTEGER (0 to 127)	Identifies the configuration of the zone.

7.33   Message Type

The *Message Type* IE contains information used to identify the message.

Table 7.33-1

Name	Presence	Type or reference	Description
Message Type	M	INTEGER (0 to 1 023)	The following values shall be used: "0" - REGISTRATION REQUEST message "1" - REGISTRATION RESPONSE message "2" - DEREGISTRATION REQUEST message "3" - DEREGISTRATION RESPONSE message "4" - CONNECTIVITY CHECK NOTIFICATION message "5" - CONNECTIVITY CHECK NOTIFICATION ACK message "6" - CONNECTIVITY CHECK REQUEST message "7" - CONNECTIVITY CHECK RESPONSE message "8" - eLSRAI NOTIFICATION message "9" - eLSRAI NOTIFICATION ACK message "10" - eLSRAI REQUEST message "11" - eLSRAI RESPONSE message "12" - eLSRAI CONFIRMATION REQUEST message "13" - eLSRAI CONFIRMATION RESPONSE message "14" - eLSR GRANT REQUEST message "15" - eLSR GRANT RESPONSE message "16" - eLSR GRANT RELINQUESHMENT REQUEST message "17" - eLSR GRANT RELINQUISHMENT REQUEST message

7.34   Transaction ID

The *Transaction ID* IE contains information used to identify the specific instance of a procedure which the message belongs to do.

Table 7.34-1

Name	Presence	Type or reference	Description
Transaction ID	M	INTEGER (0 to 4 095)	Indicates the specific instance of the procedure. Transaction IDs may be reused after the completion of a procedure.

7.35   ELR ID

The E*LR ID* IE enables the eLC to identify the eLR involved in the message exchange via LSA_1.

Table 7.35-1

Name	Presence	Type or reference	Description
ELR ID	M	INTEGER (0 to 4 095)	Indicates the eLR.

7.36   ELC ID

The E*LC ID* IE enables the eLR to identify the eLC involved in the message exchange via LSA_1.

Table 7.36-1

Name	Presence	Type or reference	Description
ELC ID	M	INTEGER (0 to 65 535)	Indicates the eLC.

7.37   VSP ID

The *VSP ID* IE enables the eLR to identify the VSP involved in the message exchange via LSA_1. The VSP identity equal to zero (0) is used to identify all VSPs registered in an eLC and shall not be allocated to identify a specific VSP.

Table 7.37-1

Name	Presence	Type or reference	Description
VSP ID	M	INTEGER (0 to 65 535)	Indicates the VSP.

7.38   L-ID

The *L-ID* IE enables the eLR to identify the license or lease involved in the message exchange via LSA_1.

Table 7.38-1

Name	Presence	Type or reference	Description
L-ID	M	INTEGER (0 to 65 535)	Indicates the license or lease.

7.39   Mode of Operation

The *Mode of Operation* IE is used to identify the detached operation mode.

Table 7.39-1

Name	Presence	Type or reference	Description
Mode of Operation	M	ENUMERATED (DOM)	Indicates the mode of operation.

7.40   eLSA1 Availability in DOM

The *eLSA1 Availability in DOM* IE indicates activation or deactivation of the $eLSA_1$.

Table 7.40-1

Name	Presence	Type or reference	Description
eLSA1 Availability in DOM	M	ENUMERATED (Activate, Deactivate)	Indicates the activation or deactivation of the $eLSA_1$ interface.

7.41   Result

The *Result* IE is included in a response message and indicates whether the procedure is successful.

Table 7.41-1

Name	Presence	Type or reference	Description
Result	M	ENUMERATED (Successful, Unsuccessful)	Indicates the result of the procedure.

7.42   Sync ID

The *Sync ID* IE is used to identify the specific synchronization process.

Table 7.42-1

Name	Presence	Type or reference	Description
Sync ID	M	INTEGER (0 to 255)	Indicates that the message is part of the synchronization process associated with this ID. Sync IDs may be reused after the completion of the respective synchronization process.

7.43   Sync Zone List

The *Sync Zone List* IE contains information about the zones received during a synchronization process.

Table 7.43-1

Name	Presence	Type or reference	Description
Number of zones	M	INTEGER (0 to 65 535)	Identifies the number of zones N received during the synchronization process. If set to "0", it indicates that the following IEs should not be included, and if included, shall be ignored.
Synched Zone 1	O	7.44	Includes zone parameters for zone 1.
Synched Zone 2	O	7.44	Includes zone parameters for zone 2.
…	…	…	…
Synched Zone N	O	7.44	Includes zone parameters for zone N.

7.44 Synched Zone

The *Synched Zone* IE contains information about a zone received during the synchronization process.

Table 7.44-1

Name	Presence	Type or reference	Description
Zone ID	M	7.47	Identifies the zone ID.
Zone Configuration Index	M	7.32	Identifies the configuration of the zone.

7.45 Cause

The *Cause* IE indicates the reason for a particular event associated with the message that includes the IE.

Table 7.45-1

Name	Presence	Type or reference	Description
Cause Type	M	INTEGER (0 to 1 023)	The following values shall be used: "0" - unspecified "1" - Message not compatible with receiver state "2" - Incorrect parameter combination "3" - Duplicate transaction ID "4" - Unknown or incorrect eLR ID "5" - Unknown or incorrect eLC ID "6" - Unknown Licensee ID "7" - Normal connectivity check "8" - Previous messages not acknowledged, or not correctly received "9" - Incomplete zone parameters "10" - Unknown Zone ID "11" - Modification of Zone Type Not Allowed "12" - New Zone ID already allocated "13" - Inconsistent zone configuration index "14" - Radio constraints profile error "15" - Inconsistent zone parameters (time) "16" - Inconsistent zone parameters (frequency) "17" - Inconsistent zone parameters (radio constraints) "18" - Inconsistent zone parameters (geographical) "19" - eLSRAI Request Type not understood "20" - Incorrect parameters for Confirmed zone "21" - Incorrect zone list "22" - Protocol version(s) not supported "23" - Synchronization process ongoing "24" - Radio Constraints Profile identifier not consistent with the zone type "25" - The requested area of the allowance Zone is not available "26" - The request cannot be granted because of not enough available spectrum resources "27" - DOM is not supported

Table 7.45-2 provides explanations for the above values of the *Cause* IE.

Table 7.45-2

Cause Value	Explanation
Unspecified	Sent when none of the specified cause values apply.
Message not compatible with receiver state	The received message was not compatible with the receiver state.
Incorrect parameter combination	The combination of parameters provided in the message is not correct.
Duplicate transaction ID	The transaction ID is already being used by another ongoing procedure initiated by the same node.
Unknown or incorrect eLR ID	The eLR ID received is not known or there is no operational interface towards it.
Unknown or incorrect eLC ID	The eLC ID received is not known or there is no operational interface towards it.
Unknown L-ID	The received L-ID is not known or supported by the eLR.
Normal connectivity check	The connectivity check is triggered under normal conditions.
Previous messages not acknowledged, or not correctly received	The connectivity check is triggered due to protocol errors.
Incomplete zone parameters	A received zone has missing parameters.
Unknown Zone ID	The Zone ID to be modified or deleted is not known.
Modification of Zone Type Not Allowed	The eLC has received a request for a modification of the Zone Type.
New Zone ID already allocated	The Zone ID (for a Zone that is to be created) is already allocated.
Inconsistent zone configuration index	The Zone Configuration Index is not consistent (e.g. for a zone modification, it has the same or lower value than the stored Index for the same Zone).
Radio constraints profile error	The radio constraints profile is not known, or radio parameters are missing for the profile.
Inconsistent zone parameters (time)	Time parameters of a zone are incorrect or inconsistent.
Inconsistent zone parameters (frequency)	Frequency parameters of a zone are incorrect or inconsistent.
Inconsistent zone parameters (radio constraints)	Radio constraint parameters of a zone are incorrect or inconsistent.
Inconsistent zone parameters (geographical)	Geographical parameters of a zone are incorrect or inconsistent.
eLSRAI Request Type not understood	eLSRAI Request type uses unknown value.
Incorrect parameters for Confirmed zone	Zone ID or Confirmation Index are not consistent with current eLSRAI context at eLR.
Incorrect zone list	The received zone list does not match the locally stored list (eLSRAI Context).
Protocol version(s) not supported	The eLR does not support any of the protocol versions previously signalled by the eLC.
Synchronization process ongoing	The procedure failed because there is an ongoing synchronization process.
Radio Constraints Profile identifier not consistent with the zone type	The Radio Constraints Profile identifier is not consistent with the zone type.
Requested area is not available	The requested area is e.g. at least partially outside of the country borders, the requested area overlaps with an exclusion zone, etc.
Not enough spectrum resources available	Reference to cause details.

7.46 Cause Details

The *Cause Details* IE may be used when a *Cause* IE responds with a value "The request cannot be granted because of not enough available resources". The *Cause Details* IE identifies what spectrum resources are available for the requested area (allowance zone).

Table 7.46-1

Name	Presence	Type or reference	Description
Frequency Blocks	O	7.7	Available frequencies

7.47 Zone ID

The *Zone ID* IE is used to identify a zone uniquely over all instances of the LSA_1 interface for a given eLR.

Table 7.47-1

Name	Presence	Type or reference	Description
Zone ID	M	INTEGER (0 to 16 777 215)	Identifies the zone.

7.48 Protocol Version List

The *Protocol Version List* IE contains information about the protocol versions supported by a protocol endpoint.

Table 7.48-1

Name	Presence	Type or reference	Description
Number of versions	M	INTEGER (1 to 63)	Identifies the number N of versions supported by the endpoint.
Protocol Version 1	M	7.49	Supported protocol version 1.
Protocol Version 2	O	7.49	Supported protocol version 2.
…	…	…	…
Protocol Version N	O	7.49	Supported protocol version N.

7.49 Protocol Version

The *Protocol Version* IE is used to identify the protocol version.

Table 7.49-1

Name	Presence	Type or reference	Description
Protocol Version	M	INTEGER (1 to 255)	Indicates the protocol version.

Annex A (informative):
Detached Operation Mode Scenarios and Workflow

Typical use cases demanding DOM operation are e.g. nomadic PMSE events (e.g. touring special events, electronic news gathering), agriculture or construction sites.

Prerequisite for a VSP to operate in detached operation mode on an eLSR is that the Sharing Framework, the Spectrum Sharing Arrangement and/or the individual rights explicitly allow for it. They contain respective details on the maximum duration of the disconnection period, the acceptable response times and the required periodicity for reconnection.

If eLSRAI changes during the duration of the DOM period, the respective MFCNs changes may be delayed according to the allowed response times.

After a successful registration procedure, the eLC remains registered during the whole duration of the agreed detached operation period.

If the eLSR is not pre-allocated to the VSP but needs to be assigned on-demand by the eLR, eLC has to signal the requirement to operate in DOM using the eLSR Grant Request message.

DOM handling is described in clause 4.2. The following figure illustrates the message flow, highlighting the relevant IEs, at the eLSA$_1$ interface for a VSP to request and switch into detached operation mode. During the DOM period, an eLC can re-initiate the eLSA1 interface at any time it needs to do so. For that, the eLC sends a CONFIRMATION REQUEST MESSAGE to the eLR.
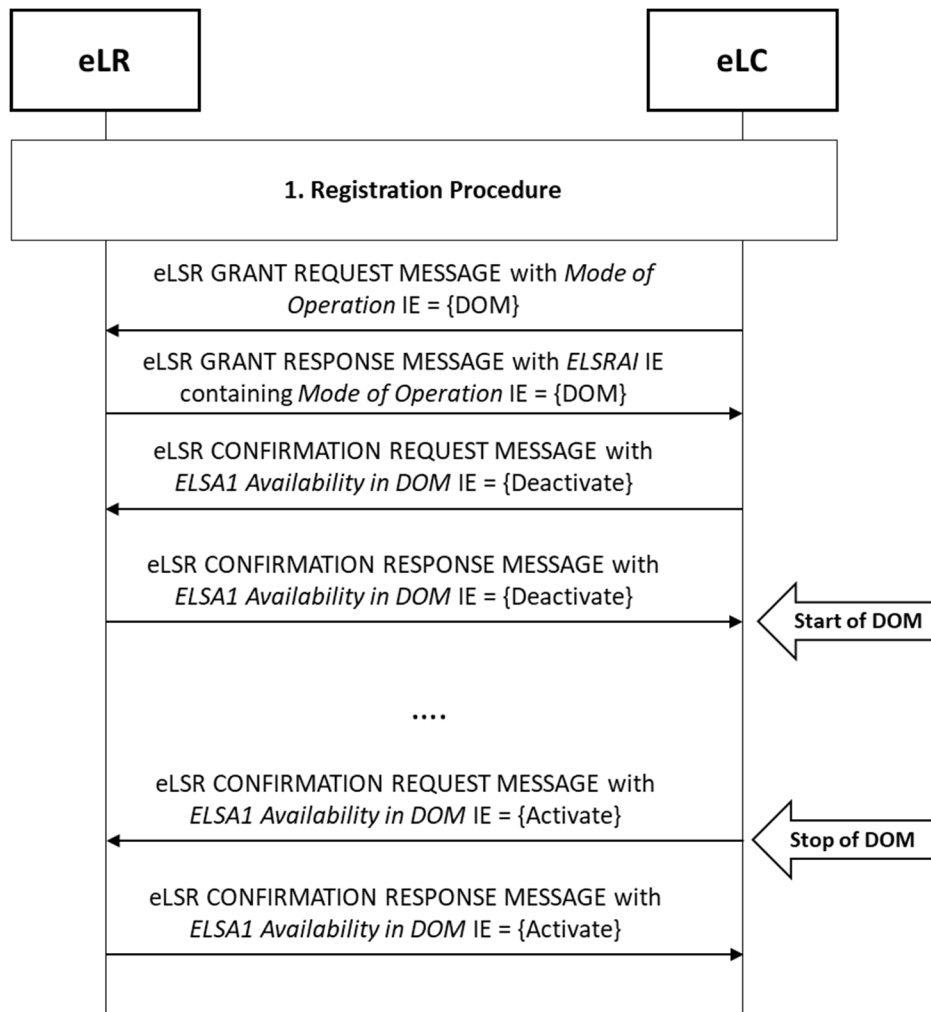

Figure A-1

History

Document history		
V1.1.1	January 2021	Publication
V1.1.2	June 2021	Publication