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Abstract

This document contains a compilation of all defects found up until the publication date for SUA [RFC3868] [1]. These defects may be of an editorial or technical nature. This document may be thought of as a companion document to be used in the implementation of SUA to clarify errors in the original SUA document. This document updates RFC3868 and text within this document supersedes the text found in RFC3868.
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1. INTRODUCTION

This document contains a compilation of all defects found up until the publication date for the SCCP User Adaptation Layer (SUA) [RFC3868]. These defects may be of an editorial or technical nature. This document may be thought of as a companion document to be used in the implementation of SUA to clarify errors in the original SUA document. This document updates RFC3868 and text within this document, where noted, supersedes the text found in RFC3868. Each error will be detailed within this document in the form of:

- The problem description,
- The text quoted from RFC3868,
- The replacement text,
- A description of the solution.

1.1. Terminology

The terms are commonly identified in related work SUA [RFC3868] [1].

1.2. Conventions
2. Correction to RFC3868

2.1. Routing context list in connectionless and connectionoriented messages

2.1.1. Description of the problem

The routing context parameter of a connectionless and connectionoriented message can contain a list of routing contexts. Normally, the addressing info present in the message will yield only a single routing context. A list of routing contexts is valid only for SSNM, ASPTM and RKM messages.

2.1.2. Text changes to the document

---------
Old text: (Section 3.9.6)
---------

The Routing Context parameter contains (a list of) 4-byte unsigned integers indexing the Application Server traffic that the sending ASP is configured/registered to receive. There is a one-to-one relationship between an index entry and a Routing Key or AS Name.

---------
New text: (Section 3.9.6)
---------

The Routing Context parameter contains (a list of) 4-byte unsigned integers indexing the Application Server traffic that the sending ASP is configured/registered to receive. There is a one-to-one relationship between an index entry and a Routing Key or AS Name.

A list of routing contexts is only valid for SSNM, ASPTM and RKM messages. All other messages can contain only a single Routing Context.

2.1.3. Solution description

Only 1 routing context value may be included in the routing context parameter of a connectionless and connectionoriented message.

2.2. Congestion level parameter value

2.2.1. Description of the problem

The value of the congestion level is dependant on which info is present in the SCON message. If the SCON only contains the affected
pointcode, then the congestion level has values ranging between 0 and 3. If affected pointcode and subsystemnumber is included in the SCON message, then the value of the congestion level can be between 1 and 8.

2.2.2. Text changes to the document

-------
Old text: (Section 3.10.24)
-------

When the Congestion Level parameter is included in a SCON message that corresponds to an N-PCSTATE primitive, the Congestion Level field indicates the MTP congestion level experienced by the local or affected signalling point as indicated by the Affected Point Code(s) also in the SCON message. In this case, valid values for the Congestion Level field are as follows:

0  No Congestion or Undefined
1  Congestion Level 1
2  Congestion Level 2
3  Congestion Level 3

When the Congestion Level parameter is included in a SCON message that corresponds to an N-STATE primitive, the Congestion Level field indicates the SCCP restricted importance level experienced by the local or affected subsystem as indicated by the Affected Point Code and Subsystem Number also in the SCON message. In this case, valid values for the Congestion Level field range from 0 to 7, where 0 indicates the least congested and 7 indicates the most congested subsystem.

-------
New text: (Section 3.10.24)
-------

2 different congestion levels ranges can be used according to ITU and ANSI congestion control algorithms.

When the ANSI congestion control algorithm is used, the Congestion Level field indicates the MTP congestion level as experienced by the local or affected subsystem indicated by the Affected Point Code and Subsystem Number. In this case, valid values for the Congestion Level field range from 0 to 3, where 1 indicates the least congested and 3 indicates the most congested condition.
When the ITU congestion control algorithm is used, the Congestion Level field indicates the SCCP restricted importance level experienced by the local or affected subsystem as indicated by the Affected Point Code and Subsystem Number also in the SCON message. In this case, valid values for the Congestion Level field range from 1 to 8, where 1 indicates the least congested and 8 indicates the most congested condition.

2.2.3. Solution description

The ITU SCCP congestion control procedures are described in SCCP procedures [Q.714] [4] paragraph 2.6. The ANSI SCCP congestion control procedures are described in SCCP procedures [T1.112.4] [5] paragraph 5.2.4.

The SCC message in SCCP takes the value range 1..8, so the corresponding SCON should also be in that range. To indicate no congestion, it is sufficient to send only a DAVA.

2.3. Segmentation parameter value

2.3.1. Description of the problem

The original sequence delivery option as original demanded (= before the segmenting) by the SCCP application is not preserved after segmentation. The receiving SCCP application will always receive the message with sequenced delivery option set to 1.

2.3.2. Text changes to the document

--------
Old text: (Section 3.10.23)
--------

The first/remaining segments field is formatted as follows:

- bit 8 (MSB) : indicates whether this is the first segment (1) or not (0)
- bits 1-7: indicate the number of remaining segments, value between 0 and 15
The segmentation parameter consists of the following:

- bit 0: first/remaining segment bit: first = 1, remaining = 0
- bit 1: sequence delivery option as originally demanded (= before the segmenting) by the SCCP application. class 0 = 0, class 1 = 1.
- bit 2-3: spare
- bit 4-7: number of remaining segments (4 bits, values 0 - 15)
- bit 8-31: segmentation reference (3 byte integer)

### 2.3.3. Solution description

The segmentation parameter gets an extra bit (out of the spare bits present) indicating the original requested sequence delivery option as originally demanded by the sending SCCP application.

### 2.4. DAUD response message ordering

#### 2.4.1. Description of the problem

Should a SCON be sent before the DAVA or DRST or after? The SCON is sent first and DAVA/DRST after in M3UA.

#### 2.4.2. Text changes to the document

The SGP SHOULD respond to a DAUD message with the availability and congestion status of the subsystem. The status of each SS7 destination or subsystem requested is indicated in a DUNA message (if unavailable), a DAVA message (if available), or a DRST (if restricted and the SGP supports this feature). If the SS7 destination or subsystem is available and congested, the SGP responds with an SCON message in addition to the DAVA message. If the SS7 destination or subsystem is restricted and congested, the SGP responds with an SCON message in addition to the DRST. If the SGP has no information on the availability / congestion status of the SS7 destination or subsystem, the SGP responds with a DUNA message, as it has no routing information to allow it to route traffic to this destination or
subsystem.

--------

New text: (Section 4.5.3)
--------

The SGP SHOULD respond to a DAUD message with the availability and congestion status of the subsystem. The status of each SS7 destination or subsystem requested is indicated in a DUNA message (if unavailable), a DAVA message (if available), or a DRST (if restricted and the SGP supports this feature). If the SS7 destination or subsystem is available and congested, the SGP responds with an SCON message and a DAVA message. If the SS7 destination or subsystem is restricted and congested, the SGP responds with an SCON message and a DRST. If the SGP has no information on the availability / congestion status of the SS7 destination or subsystem, the SGP responds with a DUNA message, as it has no routing information to allow it to route traffic to this destination or subsystem.

2.4.3. Solution description

The DAVA/DUNA/DRST/SCON messages may be send in random order. However if a SCON is send first and the destination is inaccessible, the SCON will be dropped. So it might be better to send the DAVA first followed by the SCON.

2.5. Host name parameter

2.5.1. Description of the problem

The hostname is actually a Fully Qualified Domain Name (FQDN) as defined in RFC1983. The definition of the hostname (as found in RFC1983) would only allow for a part of the FQDN and that does not uniquely identify an endpoint. Also the encoding of the FQDN is not clear.

2.5.2. Text changes to the document

--------

Old text: (Section 3.10.2.7)
--------

This field contains a host name in "host name syntax" per RFC 1123 Section 2.1 [1123]. The method for resolving the host name is out of scope for this document.

--------

New text: (Section 3.10.2.7)
This field contains a host name in "Fully Qualified Domain Name syntax" per RFC 1035 section 3.1 [RFC1035] [3]. The method for resolving the host name is out of scope for this document.

2.5.3. Solution description

The hostname is actually a Fully Qualified Domain Name (FQDN) which should be encoded following the RFC1035 section 3.1 coding rules.

2.6. ASP routing context

2.6.1. Description of the problem

An ASP routes responses to the SGP that it received messages from; within the routing context which it is currently active and receiving traffic.

2.6.2. Text changes to the document

Old text: (Section 1.5.2)

An ASP routes responses to the SGP that it received messages from; within the routing context which it is currently active and receiving traffic.

New text: (Section 1.5.2)

An ASP routes responses to the SGP that it received messages from. The response will utilize the routing context from the received messages.

2.6.3. Solution description

a. A routing context is an integer which is significant only for a given SGP-ASP pair. So it is circular logic to say that the ASP should use the RC to select the SGP – an RC value is meaningful only after the SGP has already assigned the RC for the msg send to the ASP.

b. An ASP can be active vis-a-vis an SGP for more than one RC – so it is not meaningful to say that the ASP uses "the" RC for which it is active. If the ASP response to a messages, it has to use the RC
of that received message in the response.

2.7. Parameters should only occur once in a message

2.7.1. Description of the problem

Parameters in SUA messages can be repeated as many times as possible. This would lead to inconsistencies, such as 2 or more destination addresses.

2.7.2. Text changes to the document

---------
Old text: (Section x.x)
---------

---------
New text: (Section x.x)
---------

2.7.3. Solution description

Unless explicitly stated or shown in a message format diagram, only one parameter of the same type is allowed in a message.

2.8. TID label parameter

2.8.1. Description of the problem

The clarity of the definition of TID label parameters is unclear.
2.8.2. Text changes to the document

--------
Old text: (Section 3.10.16)
--------

0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Tag = 0x0110         |            Length = 8         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     start     |      end      |         label value           |
+---------------+---------------+-------------------------------+

The Start parameter is the start position of label, between 0 (LSB) and 31 (MSB).

The End parameter is the end position of label, between 0 (LSB) and 31 (MSB).

Label value is a 16-bit integer, which is unique across an AS.

--------
New text: (Section 3.10.16)
--------

0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Tag = 0x0110         |            Length = 8         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     start     |      end      |         label value           |
+---------------+---------------+-------------------------------+

The Start parameter is the start position of label, between 0 (LSB) and 31 (MSB).

The End parameter is the end position of label, between 0 (LSB) and 31 (MSB).

Label value is a 16-bit integer, which is unique across an AS. The label value has to match the TCAP transaction ID between the start and the end parameter (Logical AND operation). The rest of the TCAP transaction ID between 0 and the begin parameter (if begin parameter > 0) AND the end parameter (if end parameter value < 31) and 31 is wildcarded.

An ASP that registers a label will be sent only those TID-bearing messages that match its label.

An ASP that does not register a label may be sent any TID-bearing message.
2.8.3. Solution description

The clarity of the definition of the TID and DRM label parameters is improved by adding what should be wildcarded in the TID/DRM and how to use the start and end field. It is assumed that these labels are simple values (at a certain location) that are logical ANDed (taking into account the start and end position where to apply) onto the received TID or DRN. If the result of the AND operation exactly matches the "Label" field, then the message is sent to the ASP that registered for this label via the ASPAC msg. If another ASP sends a already used label then this ASPAC must be rejected.

2.9. DRM label parameter

2.9.1. Description of the problem

See problem description TID label parameter

2.9.2. Text changes to the document

---------
Old text: (Section 3.10.15)
---------

+---------------------------------------------------------+
|          Tag = 0x010F         |            Length = 8         |
|---------------------------------------------------------|
|---------------|---------------|-----------------------------|
|     start     |      end      |         label value          |
+---------------+---------------+-----------------------------+

The Start parameter is the start position of label, between 0 (LSB) and 23 (MSB).

The End parameter is the end position of label, between 0 (LSB) and 23 (MSB).

Label value is a 16-bit integer, which is unique across an AS.
The Start parameter is the start position of label, between 0 (LSB) and 23 (MSB).

The End parameter is the end position of label, between 0 (LSB) and 23 (MSB).

Label value is a 16-bit integer, which is unique across an AS. The label value has to match the Destination Reference Number between the start and the end parameter (Logical AND operation). The rest of the DRN between 0 and the begin parameter (if begin parameter > 0) AND the end parameter (if end parameter value < 31) and 31 is wildcarded.

An ASP that registers a label will be sent only those DRN-bearing messages that match its label.

An ASP that does not register a label may be sent any DRN-bearing message.

2.9.3. Solution description

See solution description of the TID label parameter.

2.10. Usage of the TID and DRN label

2.10.1. Description of the problem

The use of the TID and DRN label parameters is unclear.
2.10.2. Text changes to the document

--------
Old text: (Section 4.7.2.1)
--------

After association setup and registration, an ASP normally goes active for each AS it registered for. In the ASPAC message, the ASP includes a TID and/or DRN Label Parameter, if applicable for the AS in question. All the ASPs within the AS must specify a unique label at a fixed position in the TID or DRN parameter. The same ASPAC message is sent to each SG used for interworking with the SS7 network.

The SG builds, per RK, a list of ASPs that have registered for it. The SG can now build up and update a distribution table for a certain Routing Context, any time the association is (re-)established and the ASP goes active. The SG has to perform some trivial plausibility checks on the parameters:

- Start and End parameters values are between 0 and 31 for TID.
- Start and End parameters values are between 0 and 23 for DRN
- ...
- Start values are the same for each ASP within a RC
- End values are the same for each ASP within a RC
- TID and DRN Label values must be unique across the RC

If any of these checks fail, the SG refuses the ASPAC request, with an error: Invalid loadsharing label.
New text: (Section 4.7.2.1)

After association setup and registration, an ASP normally goes active for each AS it registered for. In the ASPAC message, the ASP can include a TID and/or DRN Label Parameter, if applicable for the AS in question.

If at least one of the ASPs within an AS specifies a label, then all the ASPs within the AS must specify a unique label in the ASPAC’s msg they send.

Each of the ASPs within the AS must specify a unique label at a fixed position in the TID or DRN parameter. The ASP must send the same ASPAC to each SG it is attached to, for interworking with the SS7 network.

The SG builds, per RC, a list of ASPs that have registered for it. The SG can now build up and update a distribution table for a certain Routing Context, any time the association is (re-)established and the ASP goes active. The SG has to perform some trivial plausibility checks on the parameters:

- Start and End parameters values are between 0 and 31 for TID.
- Start and End parameters values are between 0 and 23 for DRN
- ... Start values are the same for each ASP within a RC
- End values are the same for each ASP within a RC
- TID and/or DRN Label values must be unique across the RC

If any of these checks fail, the SG refuses the ASPAC request, with an error, "Invalid loadsharing label."

Old text: (Section 4.7.3.1)

Messages not containing a destination (or "responding") TID, i.e., Query, Begin, Unidirectional, are loadshared among the available ASPs. Any scheme permitting a fair load distribution among the ASPs is allowed (e.g., round robin).

When a destination TID is present, the SG extracts the label and selects the ASP that corresponds with it.

If an ASP is not available, the SG may generate (X)UDTS "routing failure", if the return option is used.
Messages not containing a destination (or "responding") TID, i.e., Query, Begin, Unidirectional, are loadshared among the available ASPs. Any scheme permitting a fair load distribution among the ASPs is allowed (e.g., round robin).

When a destination TID is present, the SG extracts the label and if the result of the AND operation exactly matches the "Label" field, then the message is sent to the ASP that registered for this label via the ASPAC msg.

An ASP that registers a label will be sent only those TID-bearing messages that match its label.

An ASP that does not register a label may be sent any TID-bearing message.

If an ASP is not available, the SG may generate (X)UDTS "routing failure", if the return option is used.

2.10.3. Solution description

Improving the clarity of the use of the TID and DRM label parameters:

If the result of the AND operation exactly matches the "Label" field, then the message is sent to the ASP that registered for this label via the ASPAC msg.

An ASP that registers a label will be sent only those TID-bearing messages that match its label. An ASP that does not register a label may be sent any TID-bearing message.

Redundancy - The label values are fixed length (16 bits). So why do we need both a "Start" and an "End" position for applying the mask? One or the other would seem to be enough.

Simplicity - Why bother with a partial-sized mask at a specified "start" bit. Why not just specify a "full-sized" 32-bit (TID) or 23-bit (DRM) mask? Then we do not need a "start" and "end" position.

Contradictions - Section 4.7.2.1 states that "All the ASPs within the AS _must_ specify a unique label at a fixed position in the TID or DRN parameter." The "must" here contradicts that fact the the TID and DRM parameters are listed as Optional in the ASPAC msg. Thus if
a label is present, then all ASP’s belonging to that AS, must specify a label in the ASPAC msg.

2.11. Address Range parameter

2.11.1. Description of the problem

It should explicitly state the order of the minimum and maximum addresses in this parameter. The most logical order would probably be first the min, followed by the max.

2.11.2. Text changes to the document

---------
Old text: (Section 3.10.17)
---------

Address field:

The Address field the following parameters:

Parameter
Source Address              Optional *1
Destination Address         Optional *1

Note 1: The Address field must contain pairs of Source Addresses or pairs of Destination Addresses but MUST NOT mix Source Addresses with Destination Addresses in the same Address field.

---------
New text: (Section 3.10.17)
---------

Address field:

The Address field the following parameters:

Parameter
Source Address              Optional *1
Destination Address         Optional *1

Note 1: The Address field must contain pairs of Source Addresses or pairs of Destination Addresses but MUST NOT mix Source Addresses with Destination Addresses in the same Address field. The minimum address must be first and the maximum
address must follow the minimum.

2.11.3. Solution description

State the order of the minimum and maximum addresses in this parameter. The logical order is first the min, followed by the max.

2.12. Interpretation of the mask parameter

2.12.1. Description of the problem

The mask parameter in the DAUD, DAVA and DUNA SUA messages can be in the range from 0 to 255 bits. This can go over the maximum pointcode range of 24 bits. Also if a ASP request via DAUD with a mask parameter of 24, the SG would need to return all pointcodes it know in his network to the ASP. (Which could be a lot).

2.12.2. Text changes to the document

---------
Old text: (Section 3.9.18)
---------

Mask: 8-bits

The Mask parameter can be used to identify a contiguous range of Affected Destination Point Codes, independent of the point code format. Identifying a contiguous range of Affected PCs may be useful when reception of an MTP3 management message or a linkset event simultaneously affects the availability status of a series of destinations at an SG.

The Mask parameter is an integer representing a bit mask that can be applied to the related Affected PC field. The bit mask identifies how many bits of the Affected PC field are significant and which are effectively "wild-carded". For example, a mask of "8" indicates that the last eight bits of the PC is "wild-carded". For an ANSI 24-bit Affected PC, this is equivalent to signalling that all PCs in an ANSI Cluster are unavailable. A mask of "3" indicates that the last three bits of the PC is "wild-carded". For a 14-bit ITU Affected PC, this is equivalent to signalling that an ITU Region is unavailable.
New text: (Section 3.9.18)

---

**Mask: 8-bits**

The Mask parameter can be used to identify a contiguous range of Affected Destination Point Codes, independent of the point code format. Identifying a contiguous range of Affected PCs may be useful when reception of an MTP3 management message or a linkset event simultaneously affects the availability status of a series of destinations at an SG.

The Mask parameter is an integer representing a bit mask that can be applied to the related Affected PC field. The bit mask identifies how many bits of the Affected PC field are significant and which are effectively "wild-carded". For example, a mask of "8" indicates that the last eight bits of the PC is "wild-carded". For an ANSI 24-bit Affected PC, this is equivalent to signalling that all PCs in an ANSI Cluster are unavailable. A mask of "3" indicates that the last three bits of the PC is "wild-carded".

The range of mask parameter is limited to 0-24 for ANSI networks and is NOT used for ITU networks.

2.12.3. Solution description

The parameter is limited to 14 bits for ANSI networks and is NOT USED in ITU networks.

2.13. Reply on errors contained in a error message

2.13.1. Description of the problem

If a error message arrives with a error in it, what should be send out? Nothing in the [RFC3868](https://www.rfc-editor.org/rfc/rfc3868) describes this possibility.

2.13.2. Text changes to the document

---

Old text: (Section 3.7.1)
New text: (Section 3.7.1)

Error messages MUST NOT be generated in response to other Error messages.

2.13.3. Solution description

No error msg must be send back in response on a received error message (containing a error). This would otherwise possibly lead to a storm of exchange error messages.

2.14. Use of stream 0 for SSNM messages

2.14.1. Description of the problem

There seems to be some confusion in paragraph 4.5.1. First it is mentioned NOT to use stream 0 but a few lines later you MUST use stream 0 and that happen all in the same context of sending SSNM messages (DAUD, DUNA, DAVA..). It also contradicts statements made in paragraph 4.1.1.

2.14.2. Text changes to the document

Old text: (Section 4.5.1)

DUNA, DAVA, SCON, and DRST messages are sent sequentially and processed at the receiver in the order sent. SCTP stream 0 SHOULD NOT be used. The Unordered bit in the SCTP DATA chunk MAY be used for the SCON message.

Sequencing is not required for the DUPU or DAUD messages, which MAY be sent unordered. SCTP stream 0 is used, with optional use of the Unordered bit in the SCTP DATA chunk.
DUNA, DAVA, SCON, and DRST messages are sent sequentially and processed at the receiver in the order sent. The Unordered bit in the SCTP DATA chunk MAY be used for the SCON message.

Sequencing is not required for the DUPU or DAUD messages, which MAY be sent unordered. SCTP stream 0 is used, with optional use of the Unordered bit in the SCTP DATA chunk.

2.14.3. Solution description

The SSNM messages should be send on stream 0 of the association.

2.15. Timer Ta does not exist

2.15.1. Description of the problem

Timer Ta is mentioned in paragraph 8 but nowhere specified.

2.15.2. Text changes to the document

---

Old text: (Section 8)

---

8. Timer Values

<table>
<thead>
<tr>
<th>Timer</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ta</td>
<td>2 seconds</td>
</tr>
<tr>
<td>Tr</td>
<td>2 seconds</td>
</tr>
<tr>
<td>T(ack)</td>
<td>2 seconds</td>
</tr>
<tr>
<td>T(ias)</td>
<td>Inactivity Send timer 7 minutes</td>
</tr>
<tr>
<td>T(iar)</td>
<td>Inactivity Receive timer 15 minutes</td>
</tr>
<tr>
<td>T(beat)</td>
<td>Heartbeat Timer 30 seconds</td>
</tr>
</tbody>
</table>
8. Timer Values

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tr</td>
<td></td>
<td>2 seconds</td>
</tr>
<tr>
<td>T(ack)</td>
<td></td>
<td>2 seconds</td>
</tr>
<tr>
<td>T(ias)</td>
<td>Inactivity Send timer</td>
<td>7 minutes</td>
</tr>
<tr>
<td>T(iar)</td>
<td>Inactivity Receive timer</td>
<td>15 minutes</td>
</tr>
<tr>
<td>T(beat)</td>
<td>Heartbeat Timer</td>
<td>30 seconds</td>
</tr>
</tbody>
</table>

2.15.3. Solution description

Timer Ta is removed.

2.16. Error response on unsupported RKM messages

2.16.1. Description of the problem

If RKM messages are not supported by a implementation, a error message is send back with error cause "unsupported message Type". We should send back a error message with error cause "unsupported message class".

2.16.2. Text changes to the document

Old text: (Section 4.4.1)

If the SGP does not support the registration procedure, the SGP returns an Error message to the ASP, with an error code of "Unsupported Message Type".

New text: (Section 4.4.1)

If the SGP does not support the registration procedure, the SGP returns an Error message to the ASP, with an error code of "Unsupported Message Class".
If the SGP determines that the requested RK partially, but not exactly, matches an existing RK, and that an incoming signalling message received at an SGP could possibly match both the requested and the existing RK, the SGP returns a Registration Response message to the ASP, with a Registration Status of "Error - Cannot Support Unique Routing. An incoming signalling message received at an SGP should not match against more than one Routing Key.

If the SGP determines that the received RK was already registered, fully and exactly, either statically or dynamically, by the sending ASP, the SGP returns a Registration Response message to the ASP, containing a Registration Result "Error - Routing Key Already Registered ". This error applies whether the sending ASP/IPSP is in ASP-ACTIVE or ASP-INACTIVE for the corresponding AS. For this error code, the RC field in the Registration Response message MUST be populated with the actual value of RC in SGP corresponding to the specified RK in the Registration Request message.

If an SGP determines that a received Routing Key does not currently exist, and the SGP supports dynamic configuration but requires that the Routing Key first be manually provisioned at the SGP, the SGP returns a Registration Response message to the ASP, containing a Registration Result "Error - Routing Key not Currently Provisioned.

An ASP MAY modify an existing Routing Key by including a Routing Context parameter in the REG REQ. If the SGP determines that the Routing Context applies to an existing Routing Key, the SG MAY adjust the existing Routing Key to match the new information provided in the Routing Key parameter. A Registration Response "Routing Key Change Refused" is returned if the SGP does not accept the modification of the Routing Key.
An ASP MAY request modification of an existing Routing Key by including a Routing Context parameter in a Registration Request message. Upon receipt of a Registration Request message containing a Routing Context, if the SGP determines that the Routing Context applies to an existing Routing Key, the SGP MAY adjust the existing Routing Key to match the new information provided in the Routing Key parameter. A Registration Response "ERR ? Routing Key Change Refused" is returned if the SGP does not support this re-registration procedure or RC does not exist. Otherwise, a Registration Response "Successfully Registered" is returned.

2.16.3. Solution description

Send back an error message with "unsupported message class". If >RKM messages are not supported, the implementation actually rejects a whole class of messages, not just a single one. Other error messages are send back depending on the partial or complete match of the Routing key with the provisioned data.

2.17. Filler/padding in Global title parameter

2.17.1. Description of the problem

The global title digits part of the global title parameter contains filler bytes. They should be called padding bytes so that they are not included in the calculation of the length of the global title parameter.
2.17.2. Text changes to the document

---------

Old text: (Section 3.10.2.3)
---------

Global Title:

Octets contain a number of address signals and possibly filler as shown:

```
+---+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| 2 addr. | 1 addr. | 4 addr. | 3 addr. | 6 addr. | 5 addr. | 8 addr. | 7 addr. |
|   sig. |   sig. |   sig. |   sig. |   sig. |   sig. |   sig. |   sig. |
+---+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        .............          | filler | N addr. | filler |
|                   | if req |   sig. |               |
+---+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

All filler bits SHOULD be set to 0.
```

---------

New text: (Section 3.10.2.3)
---------

Global Title:

Octets contain a number of address signals and possibly filler and padding as shown:

```
+---+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| 2 addr. | 1 addr. | 4 addr. | 3 addr. | 6 addr. | 5 addr. | 8 addr. | 7 addr. |
|   sig. |   sig. |   sig. |   sig. |   sig. |   sig. |   sig. |   sig. |
+---+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        .............          | filler | N addr. | padding |
|                   | if req |   sig. |               |
+---+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

All filler and padding bits SHOULD be set to 0.
2.17.3. Solution description

Insert padding into definition of the global title parameter.

2.18. Inclusion of routing context in the Routing key parameter

2.18.1. Description of the problem

The Routing context is missing from the Routing key parameter of the REG message, so leading to an inconsistency with section 4.4.1 where it is mentioned that the RC has to be present in order to change the registration data of a certain RC. If the RC is not present, then the registration data can not be identified and changed.

2.18.2. Text changes to the document

---------
Old text: (Section 3.10.14)
---------
The Key field contains the following parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic Mode Type</td>
<td>Optional</td>
</tr>
<tr>
<td>Network Appearance</td>
<td>Optional</td>
</tr>
<tr>
<td>Source Address</td>
<td>Optional</td>
</tr>
<tr>
<td>Destination Address</td>
<td>Optional</td>
</tr>
<tr>
<td>Address Range</td>
<td>Optional</td>
</tr>
</tbody>
</table>

Note 1: The Network Appearance parameter must be included in the Routing Key when the ASP is able to register in multiple SS7 Network contexts.
New text: (Section 3.10.14)

The Key field contains the following parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic Mode Type</td>
<td>Optional</td>
</tr>
<tr>
<td>Network Appearance</td>
<td>Optional *1</td>
</tr>
<tr>
<td>Source Address</td>
<td>Optional</td>
</tr>
<tr>
<td>Destination Address</td>
<td>Optional</td>
</tr>
<tr>
<td>Address Range</td>
<td>Optional</td>
</tr>
<tr>
<td>Routing Context</td>
<td>Optional *2</td>
</tr>
</tbody>
</table>

Note 1: The Network Appearance parameter must be included in the Routing Key when the ASP is able to register in multiple SS7 Network contexts.

Note 2: The Routing Context parameter is included in the Routing Key when the ASP wishes to alter an existing Routing Key which corresponds to the indicated Routing Context. The Routing Context parameter MUST only occur once in the Key parameters.

2.18.3. Solution description

Include the routing context parameter in the routing key parameter. And keep the text of section 4.4.1.

2.19. New registration status parameter value

2.19.1. Description of the problem

A new registration status parameter value is required in case that a routing key change is refused.
2.19.2.  Text changes to the document

---------
Old text: (Section 3.9.22)
---------
Registration Status: 32-bits (unsigned integer)

The Registration Status field indicates the success or the reason for failure of a registration request.

Its values may be:

0          Successfully Registered
1          Error - Unknown
2          Error - Invalid Destination Address
3          Error - Invalid Network Appearance
4          Error - Invalid Routing Key
5          Error - Permission Denied
6          Error - Cannot Support Unique Routing
7          Error - Routing Key not Currently Provisioned
8          Error - Insufficient Resources
9          Error - Unsupported RK parameter Field
10         Error - Unsupported/Invalid Traffic Mode Type
11         Error - Routing Key Change Refused

---------
New text: (Section 3.9.22)
---------
Registration Status: 32-bits (unsigned integer)

The Registration Status field indicates the success or the reason for failure of a registration request.

Its values may be:

0          Successfully Registered
1          Error - Unknown
2          Error - Invalid Destination Address
3          Error - Invalid Network Appearance
4          Error - Invalid Routing Key
5          Error - Permission Denied
6          Error - Cannot Support Unique Routing
7          Error - Routing Key not Currently Provisioned
8          Error - Insufficient Resources
9          Error - Unsupported RK parameter Field
10         Error - Unsupported/Invalid Traffic Mode Type
11         Error - Routing Key Change Refused
12         Error - Routing Key already registered
2.19.3. Solution description

Add new Registration response "Error - Routing key already registered".
3. Security considerations

No new treats have been identified besides the already known in SUA [RFC3868] [1].
4. Acknowledgments

The authors wish to thank B. Nagelberg, B. Bidulock, T. Asveren, S. Karl, K. Morneault and many others for their invaluable comments.

5. References


Appendix A. Changes Control

A.1. Changes from v00 to v01

- Change of boilerplate
- Typos.
- Paragraph 2.6 ASP routing context: replacement text for section 1.5.2
- Paragraph 2.10 Usage of TID and DRM label parameter: text clarification for solution description
- Paragraph 2.8 Use of ANSI intermediate signaling network identification (ISNI) parameter: Removed, no text proposed.

A.2. Changes from v01 to v02

- Typos.
- Paragraph 2.17 Filler/padding in Global title parameter: new
- Paragraph 2.18 Inclusion of routing context in the Routing key parameter: new
- Paragraph 2.8 TID label parameter: Changed: Another attempt at clarifying what a SG could be doing with TID label.
- Paragraph 2.9 DRM label parameter: Changed: Another attempt at clarifying what a SG could be doing with DRM label.
- Paragraph 2.10 Usage of TID and DRM label parameter: Changed: Another attempt at clarifying what a SG could be doing with TID and DRM labels.

A.3. Changes from v02 to v03

- Typos.
- Paragraph 2.16: Error response on unsupported RKM messages: Changed
- Paragraph 2.19: New registration status parameter value: New
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