**3GPP TSG-T (Terminals) Meeting #15** ***Tdoc TP-020058***
**Jeju Island, Korea, 6 - 8 March, 2002**

**3GPP TSG-SA WG2 meeting #23** **Tdoc S2-020910**
**Sophia Antipolis, France, 18 – 22 February 2002**

---

**Title:** Liaison Statement on "Prefix allocation for IPv6 stateless address autoconfiguration"
**Source:** SA2
**To:** CN1, CN2, CN3, SA3, SA5, T1, T2
**Cc:** CN, T

**Contact Person:**
**Name:** Juan-Antonio Ibanez
**E-mail Address:** Juan-Antonio.X.Ibanez@erv.ericsson.se

**Attachments:** S2-020760, S2-020761 and S2-020762

---

## 1. Description:

At its plenary meeting #22, SA2 approved a Change Request to 23.060 modifying the IPv6 stateless address autoconfiguration procedure. The change introduced was that every PDP context activated according to the stateless address autoconfiguration procedure is allocated a unique prefix, thus allowing the MS to freely change its interface identifier without requiring any update of the SGSN and the GGSN about its new IPv6 address.

The modified procedure approved at SA2#22 was meant to be backward compatible with the existing procedure (in R'99 and R4), as well as minimizing the changes. Since SA2 approved the changes from R'99 onwards, such constraint was not anymore justified and as a consequence SA2 has reconsidered the efficiency and completeness of the procedure, and agreed on the appropriateness of revising it. The attached CRs 305r2 (R'99), 306r2 (R4) and 286r4 (R5) have been approved at SA2#23 and replace the previous versions approved at SA2#22.

As in its previous liaison statement on the subject, SA2 kindly asks the above-mentioned groups to consider these changes in their work and investigate possible impacts on their respective specifications. SA2 would like in particular to draw the attention to the fact that PDP contexts established according to the IPv6 stateless address autoconfiguration are identified by the prefix part of the IPv6 address only, as the MS can change its interface identifier without the network being aware of it. Whether this has implications on charging, CAMEL and lawful interception has to be investigated by SA5, CN2 and SA3.

Note that SA2 does not explicitly request any response from the recipients of this liaison statement, although any feedback from other TSGs would naturally be welcome, but rather seeks to raise awareness to the new principle adopted for IPv6 stateless address autoconfiguration so that it can be taken into account in any ongoing work.

## 2. Actions:

**CN1, CN2, CN3, SA3, SA5, T1 and T2:**
To consider these changes in their work and investigate possible impacts on their respective specifications.

## 3. Date of Next SA2 Meetings:

| | | |
|---|---|---|
| SA2 #24 | 22nd – 26th April 2002 | Madrid, Spain |

SA2 #25 24th – 28th June 2002 Finland

**3GPP TSG-SA2 Meeting #23** ***Tdoc S2-020760***
**Sophia Antipolis, France, 18-22 February 2002**

*CR-Form-v4*

# CHANGE REQUEST

⌘ **23.060** **CR** **305** ⌘ ev **2** ⌘ Current version: **3.10.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

***Proposed change affects:*** ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network ☐ Core Network **X**

| | | |
|---|---|---|
| ***Title:*** | ⌘ | Allocation of unique prefixes to IPv6 terminals |
| ***Source:*** | ⌘ | Ericsson |
| ***Work item code:*** | ⌘ | TEI |
| ***Date:*** | ⌘ | 20 February 2002 |
| ***Category:*** | ⌘ | **F** |
| ***Release:*** | ⌘ | R99 |

*Use one of the following categories:*
***F*** *(correction)*
***A*** *(corresponds to a correction in an earlier release)*
***B*** *(addition of feature),*
***C*** *(functional modification of feature)*
***D*** *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

*Use one of the following releases:*
*2 (GSM Phase 2)*
*R96 (Release 1996)*
*R97 (Release 1997)*
*R98 (Release 1998)*
*R99 (Release 1999)*
*REL-4 (Release 4)*
*REL-5 (Release 5)*

***Reason for change:*** ⌘

The current mechanism for IPv6 stateless address autoconfiguration defined in 23.060 is not aligned with the standard IETF mechanism and as such is prone to incompatibilities with future developments of IPv6. Already some features of IPv6 have been identified that do not work properly with the current mechanism (e.g. privacy extensions for IPv6 defined in RFC 3041). In order to avoid such incompatibilities, today and in the future, it is therefore essential to align the support of IPv6 in GPRS/UMTS with the mechanisms defined in the IETF.

This CR corrects the current shortcomings of the IPv6 stateless address autoconfiguration in 23.060, mainly by specifying that a different prefix shall be allocated to each PDP context that uses stateless address autoconfiguration.

This principle is recommended in the Internet-Draft "draft-wasserman-3gpp-advice-00.txt", which has been produced by a design team composed of IETF IPng experts that have investigated the use of IPv6 in the 3GPP architecture. It shall be noted that these experts do not believe that this principle could lead to an over-consumption of the vast IPv6 addressing space, as indicated in the Internet-Draft.

Note that the IETF IPng working group has adopted this Internet-Draft as working group item in the last IETF meeting (Dec 2001), with the intention to quickly progress it to the status of informational RFC.

***Summary of change:*** ⌘

The IPv6 stateless address autoconfiguration procedure is modified to support allocation of a distinct prefix to each PDP context.

***Consequences if not approved:*** ⌘

The support of IPv6 stateless address autoconfiguration in GPRS will not be aligned with the standard IETF mechanism and therefore risks not being compatible with future developments of IPv6 in IETF.

| | | |
|---|---|---|
| ***Clauses affected:*** | ⌘ | 9.2.1.1 |
| ***Other specs affected:*** | ⌘ | ☐ Other core specifications ⌘<br>☐ Test specifications<br>☐ O&M Specifications |
| ***Other comments:*** | ⌘ | It shall be noted that only the UE and the GGSN are impacted by these changes. The SGSN remains untouched. |

### 9.2.1.1 Dynamic IPv6 Address Allocation

IPv6 address allocation is somewhat different from the IPv4 address allocation procedure. There are two possibilities to allocate the address for an IPv6 node – stateless and stateful autoconfiguration. The stateful address allocation mechanism needs a DHCP server to allocate the address for the IPv6 node. In the stateless autoconfiguration, the IPv6 node is more involved in the allocation of the address. In addition, the stateless autoconfiguration procedure does not need any external entity involved in the address autoconfiguration.

IPv6 stateful address autoconfiguration uses the standard External PDN Address Allocation procedure, as described in 3GPP TS 29.061 [27]. The GGSN informs the MS that it shall perform ~~requests~~ stateful address autoconfiguration by means of the Router Advertisements, as defined in RFC 2461[71]. For this purpose, the GGSN shall automatically and periodically send Router Advertisement messages towards the MS after a PDP context of type IPv6 is activated. The use of stateless or stateful address autoconfiguration is configured per APN.~~using an Access Point Name referring to that service.~~

In order to support the standard IPv6 stateless address autoconfiguration mechanism, as defined by the IETF, within the particular context of UMTS (point-to-point connections, radio resource efficiency, etc), the GGSN shall assign a prefix that is unique within its scope to each PDP context applying IPv6 stateless address autoconfiguration. The size of the prefix is according to the maximum prefix length for a global IPv6 address. This avoids the necessity to perform duplicate address detection at the network level for every address built by the MS. The GGSN shall not use the prefix advertised to the MS to configure an address on any of its interfaces.

To ensure that the link-local address generated by the MS does not collide with the link-local address of the GGSN, ~~support dynamic IPv6 address allocation by the PLMN operator,~~ the GGSN shall provide~~s a unique~~ an interface identifier (see RFC 2462 [69]) to the MS and the MS shall use this interface identifier to configure its link-local address. This is applicable for both stateful and stateless IPv6 address autoconfiguration. ~~This enables the MS to perform the IPv6 stateless autoconfiguration procedures to generate its full IPv6 address.~~ In case of stateless address autoconfiguration however, the MS can choose any interface identifier to generate addresses other than link-local, without involving the network. In particular, the SGSN and the GGSN are not updated with the actual address used by the MS, as the prefix alone identifies the PDP context.

Figure 1 illustrates the IPv6 stateless autoconfiguration procedure~~s for this case~~. The figure and its description show only the messages and actions specific to the IPv6 stateless address autoconfiguration procedure. For a complete description of the PDP Context Activation Procedure, refer to the corresponding clause.

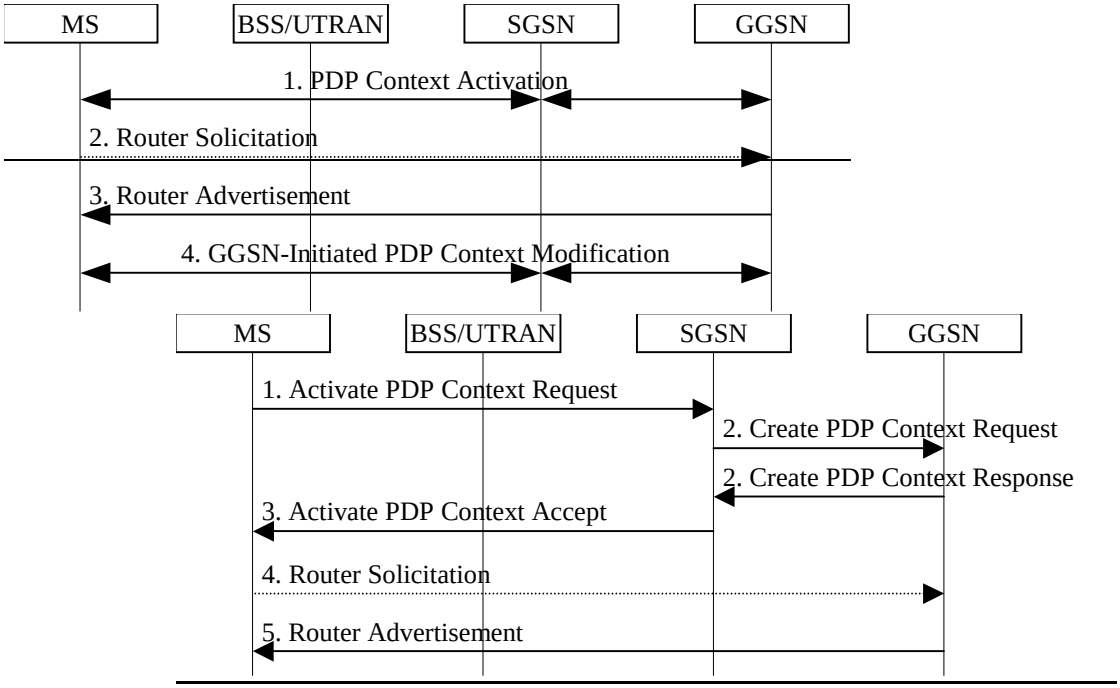


**Figure 1: IPv6 Stateless Address Autoconfiguration Procedure**

1) The MS sends an Activate PDP Context Request message to the SGSN~~. The procedure follows that~~ as defined in clause "PDP Context Activation Procedure"~~ with exceptions described below~~. The MS shall leave PDP Address empty and set PDP Type to IPv6.

~~The MS shall leave PDP Address empty and set PDP Type to IPv6.~~

2) Upon reception of the Create PDP Context Request, ~~T~~the GGSN ~~shall~~ create~~s~~ ~~the unique link-local~~ an IPv6 address composed of the prefix allocated to the PDP context and an interface identifier generated by the GGSN. ~~for the MS and send it~~ This address is then returned in the PDP Address information element in the Create PDP Context Response message. The processing of the Create PDP Context Request and Create PDP Context Response, in both the SGSN and the GGSN, is otherwise as specified in clause "PDP Context Activation Procedure".~~The link-local address consists of a fixed 10-bit prefix (IPv6 well-known link-local prefix), zero or more 0-bits, and the interface identifier.~~

NOTE: Since the MS is considered to be alone on its link towards the GGSN, the interface identifier does not need to be unique across all PDP contexts on any APN.

3) The MS receives the IPv6 address produced by the GGSN in the Activate PDP Context Accept. The MS extracts the interface identifier from the address received and stores it. The MS shall use this interface identifier to build its link-local address and may also use it for building its full IPv6 address, as describe in step 5. The MS shall ignore the prefix contained in the address received in the Activate PDP Context Accept. The processing of the Activate PDP Context Accept is otherwise as specified in clause "PDP Context Activation Procedure".

4~~2~~) The MS may send a Router Solicitation message to the GGSN to activate the sending of the Router Advertisement message.

5~~3~~) The GGSN ~~should automatically~~ send~~s~~ ~~the~~ a Router Advertisement message~~ after the PDP context is activated~~. The Router Advertisement messages shall contain the same prefix as the one provided in step 2. A given prefix shall not be advertised on more than one PDP context on a given APN, or set of APNs, within the same addressing scope. ~~In release 99 t~~The GGSN shall be configured to advertise only one ~~network~~ prefix per ~~APN~~PDP context.

After the MS has received the Router Advertisement message, it constructs its full IPv6 address by concatenating the interface identifier received in step 3~~ contained in the link-local address provided in the Create PDP Context Response Message in step 1~~, or a locally generated interface identifier, and the ~~network~~ prefix ~~of the selected APN~~ received in the Router Advertisement. If the Router Advertisement contains more than one prefix option, the MS shall only consider the first one and silently discard the others.~~Subsequently, the MS is ready to start communicating to the Internet.~~

NOTE: The MS can at any time change the interface identifier used to generate full IPv6 addresses, without involving the network, i.e. without updating the PDP context in the SGSN and the GGSN.

Because any prefix that the GGSN advertises in a PDP context is unique within the scope of the prefix (i.e. site-local or global)~~ provides a unique interface identifier during the PDP context activation procedure~~, there is no need for the MS to perform Duplicate Address Detection for this IPv6 address. Therefore, the GGSN shall ~~intercept and~~ silently discard Neighbor Solicitation messages that the MS may send to perform Duplicate Address Detection. It is possible for the MS to perform Neighbor Unreachability Detection towards the GGSN, as defined in RFC 2461[71]; therefore if the GGSN receives a Neighbor Solicitation as part of this procedure, the GGSN shall provide a Neighbor Advertisement as described in RFC 2461.

~~4) The GGSN updates the PDP context in the SGSN and MS with the full IPv6 address, see clause "GGSN Initiated PDP Context Modification Procedure".~~

**3GPP TSG-SA2 Meeting #23**
**Sophia Antipolis, France, 18-22 February 2002**

***Tdoc S2-020762***

*CR-Form-v4*

# CHANGE REQUEST

⌘ **23.060** **CR** **286** ⌘ ev **4** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

***Proposed change affects:*** ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network ☐ Core Network **X**

| | | |
|---|---|---|
| ***Title:*** | ⌘ | Allocation of unique prefixes to IPv6 terminals |
| ***Source:*** | ⌘ | Ericsson |
| ***Work item code:*** | ⌘ | IMS-CCR |
| ***Date:*** | ⌘ | 20 February 2002 |
| ***Category:*** | ⌘ | **A** |
| ***Release:*** | ⌘ | REL-5 |

*Use one of the following categories:*
***F*** *(correction)*
***A*** *(corresponds to a correction in an earlier release)*
***B*** *(addition of feature),*
***C*** *(functional modification of feature)*
***D*** *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

*Use one of the following releases:*
*2* *(GSM Phase 2)*
*R96* *(Release 1996)*
*R97* *(Release 1997)*
*R98* *(Release 1998)*
*R99* *(Release 1999)*
*REL-4* *(Release 4)*
*REL-5* *(Release 5)*

***Reason for change:*** ⌘

The current mechanism for IPv6 stateless address autoconfiguration defined in 23.060 is not aligned with the standard IETF mechanism and as such is prone to incompatibilities with future developments of IPv6. Already some features of IPv6 have been identified that do not work properly with the current mechanism (e.g. privacy extensions for IPv6 defined in RFC 3041). In order to avoid such incompatibilities, today and in the future, it is therefore essential to align the support of IPv6 in GPRS/UMTS with the mechanisms defined in the IETF.

Since IMS mandates the use of IPv6 in Release 5 and addressing is an essential aspect of the architecture, such alignment has to be considered in the same timeframe, i.e. in Release 5, so as to avoid backward compatibility problems, with terminals in particular, if these changes were to be introduced later.

This CR corrects the current shortcomings of the IPv6 stateless address autoconfiguration in 23.060, mainly by specifying that a different prefix shall be allocated to each PDP context that uses stateless address autoconfiguration.

This principle is recommended in the Internet-Draft “draft-wasserman-3gpp-advice-00.txt”, which has been produced by a design team composed of IETF IPng experts that have investigated the use of IPv6 in the 3GPP architecture. It shall be noted that these experts do not believe that this principle could lead to an over-consumption of the vast IPv6 addressing space, as indicated in the Internet-Draft.

Note that the IETF IPng working group has adopted this Internet-Draft as working group item in the last IETF meeting (Dec 2001), with the intention to quickly progress it to the status of informational RFC.

***Summary of change:*** ⌘

The IPv6 stateless address autoconfiguration procedure is modified to support allocation of a distinct prefix to each PDP context.

| | | |
|---|---|---|
| ***Consequences if not approved:*** | ⌘ | The support of IPv6 stateless address autoconfiguration in GPRS will not be aligned with the standard IETF mechanism and therefore risks not being compatible with future developments of IPv6 in IETF. |

| | | | | |
|---|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 9.2.1.1 | | |
| ***Other specs affected:*** | ⌘ | ☐ Other core specifications<br>☐ Test specifications<br>☐ O&M Specifications | ⌘ | |
| ***Other comments:*** | ⌘ | It shall be noted that only the UE and the GGSN are impacted by these changes. The SGSN remains untouched. | | |

### 9.2.1.1 Dynamic IPv6 Address Allocation

IPv6 address allocation is somewhat different from the IPv4 address allocation procedure. There are two possibilities to allocate the address for an IPv6 node – stateless and stateful autoconfiguration. The stateful address allocation mechanism needs a DHCP server to allocate the address for the IPv6 node. In the stateless autoconfiguration, the IPv6 node is more involved in the allocation of the address. In addition, the stateless autoconfiguration procedure does not need any external entity involved in the address autoconfiguration.

IPv6 stateful address autoconfiguration uses the standard External PDN Address Allocation procedure, as described in 3GPP TS 29.061 [27]. The GGSN informs the MS that it shall perform ~~requests~~ stateful address autoconfiguration by means of the Router Advertisements, as defined in RFC 2461[71]. For this purpose, the GGSN shall automatically and periodically send Router Advertisement messages towards the MS after a PDP context of type IPv6 is activated. The use of stateless or stateful address autoconfiguration is configured per APN.~~using an Access Point Name referring to that service.~~

In order to support the standard IPv6 stateless address autoconfiguration mechanism, as defined by the IETF, within the particular context of UMTS (point-to-point connections, radio resource efficiency, etc), the GGSN shall assign a prefix that is unique within its scope to each PDP context applying IPv6 stateless address autoconfiguration. The size of the prefix is according to the maximum prefix length for a global IPv6 address. This avoids the necessity to perform duplicate address detection at the network level for every address built by the MS. The GGSN shall not use the prefix advertised to the MS to configure an address on any of its interfaces.

To ensure that the link-local address generated by the MS does not collide with the link-local address of the GGSN, ~~support dynamic IPv6 address allocation by the PLMN operator,~~ the GGSN shall provide~~s a unique~~ an interface identifier (see RFC 2462 [69]) to the MS and the MS shall use this interface identifier to configure its link-local address. This is applicable for both stateful and stateless IPv6 address autoconfiguration. ~~This enables the MS to perform the IPv6 stateless autoconfiguration procedures to generate its full IPv6 address.~~ In case of stateless address autoconfiguration however, the MS can choose any interface identifier to generate addresses other than link-local, without involving the network. In particular, the SGSN and the GGSN are not updated with the actual address used by the MS, as the prefix alone identifies the PDP context.

Figure 1 illustrates the IPv6 stateless autoconfiguration procedure~~s for this case~~. The figure and its description show only the messages and actions specific to the IPv6 stateless address autoconfiguration procedure. For a complete description of the PDP Context Activation Procedure, refer to the corresponding clause.

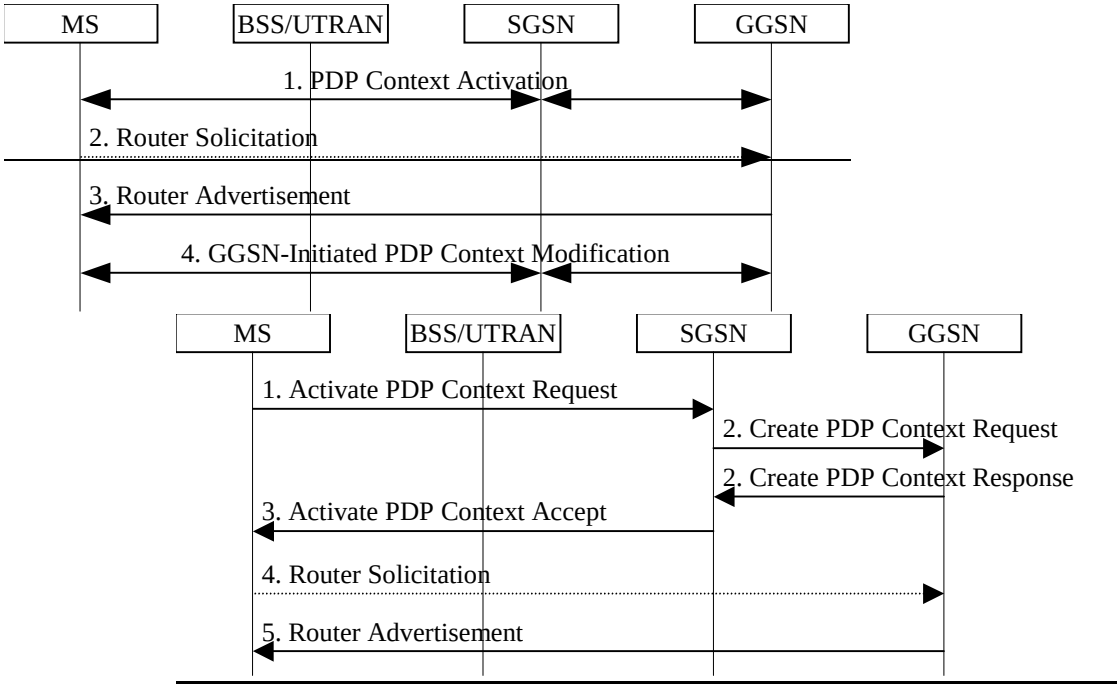


**Figure 1: IPv6 Stateless Address Autoconfiguration Procedure**

1) The MS sends an Activate PDP Context Request message to the SGSN~~. The procedure follows that~~ as defined in clause "PDP Context Activation Procedure"~~ with exceptions described below~~. The MS shall leave PDP Address empty and set PDP Type to IPv6.

~~The MS shall leave PDP Address empty and set PDP Type to IPv6.~~

2) Upon reception of the Create PDP Context Request, ~~T~~the GGSN ~~shall~~ create~~s~~ ~~the unique link-local~~ an IPv6 address composed of the prefix allocated to the PDP context and an interface identifier generated by the GGSN. ~~for the MS and send it~~ This address is then returned in the PDP Address information element in the Create PDP Context Response message. The processing of the Create PDP Context Request and Create PDP Context Response, in both the SGSN and the GGSN, is otherwise as specified in clause "PDP Context Activation Procedure".~~The link-local address consists of a fixed 10-bit prefix (IPv6 well-known link-local prefix), zero or more 0-bits, and the interface identifier.~~

NOTE: Since the MS is considered to be alone on its link towards the GGSN, the interface identifier does not need to be unique across all PDP contexts on any APN.

3) The MS receives the IPv6 address produced by the GGSN in the Activate PDP Context Accept. The MS extracts the interface identifier from the address received and stores it. The MS shall use this interface identifier to build its link-local address and may also use it for building its full IPv6 address, as describe in step 5. The MS shall ignore the prefix contained in the address received in the Activate PDP Context Accept. The processing of the Activate PDP Context Accept is otherwise as specified in clause "PDP Context Activation Procedure".

4~~2~~) The MS may send a Router Solicitation message to the GGSN to activate the sending of the Router Advertisement message.

5~~3~~) The GGSN ~~should automatically~~ send~~s~~ ~~the~~ a Router Advertisement message~~ after the PDP context is activated~~. The Router Advertisement messages shall contain the same prefix as the one provided in step 2. A given prefix shall not be advertised on more than one PDP context on a given APN, or set of APNs, within the same addressing scope. ~~In release 99 t~~The GGSN shall be configured to advertise only one ~~network~~ prefix per ~~APN~~PDP context.

After the MS has received the Router Advertisement message, it constructs its full IPv6 address by concatenating the interface identifier received in step 3~~ contained in the link-local address provided in the Create PDP Context Response Message in step 1~~, or a locally generated interface identifier, and the ~~network~~ prefix ~~of the selected APN~~ received in the Router Advertisement. If the Router Advertisement contains more than one prefix option, the MS shall only consider the first one and silently discard the others.~~Subsequently, the MS is ready to start communicating to the Internet.~~

NOTE: The MS can at any time change the interface identifier used to generate full IPv6 addresses, without involving the network, i.e. without updating the PDP context in the SGSN and the GGSN.

Because any prefix that the GGSN advertises in a PDP context is unique within the scope of the prefix (i.e. site-local or global)~~ provides a unique interface identifier during the PDP context activation procedure~~, there is no need for the MS to perform Duplicate Address Detection for this IPv6 address. Therefore, the GGSN shall ~~intercept and~~ silently discard Neighbor Solicitation messages that the MS may send to perform Duplicate Address Detection. It is possible for the MS to perform Neighbor Unreachability Detection towards the GGSN, as defined in RFC 2461[71]; therefore if the GGSN receives a Neighbor Solicitation as part of this procedure, the GGSN shall provide a Neighbor Advertisement as described in RFC 2461.

~~4) The GGSN updates the PDP context in the SGSN and MS with the full IPv6 address, see clause "GGSN-Initiated PDP Context Modification Procedure".~~

**3GPP TSG-SA2 Meeting #23** ***Tdoc S2-020761***
**Sophia Antipolis, France, 18-22 February 2002**

*CR-Form-v4*

# CHANGE REQUEST

⌘ **23.060** **CR** **306** ⌘ ev **2** ⌘ Current version: **4.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

***Proposed change affects:*** ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network ☐ Core Network **X**

| | | |
|---|---|---|
| ***Title:*** | ⌘ | Allocation of unique prefixes to IPv6 terminals |
| ***Source:*** | ⌘ | Ericsson |
| ***Work item code:*** | ⌘ | TEI4 |
| ***Date:*** | ⌘ | 20 February 2002 |
| ***Category:*** | ⌘ | **A** |
| ***Release:*** | ⌘ | REL-4 |

*Use one of the following categories:*
***F*** *(correction)*
***A*** *(corresponds to a correction in an earlier release)*
***B*** *(addition of feature),*
***C*** *(functional modification of feature)*
***D*** *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

*Use one of the following releases:*
*2* *(GSM Phase 2)*
*R96* *(Release 1996)*
*R97* *(Release 1997)*
*R98* *(Release 1998)*
*R99* *(Release 1999)*
*REL-4* *(Release 4)*
*REL-5* *(Release 5)*

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | The current mechanism for IPv6 stateless address autoconfiguration defined in 23.060 is not aligned with the standard IETF mechanism and as such is prone to incompatibilities with future developments of IPv6. Already some features of IPv6 have been identified that do not work properly with the current mechanism (e.g. privacy extensions for IPv6 defined in RFC 3041). In order to avoid such incompatibilities, today and in the future, it is therefore essential to align the support of IPv6 in GPRS/UMTS with the mechanisms defined in the IETF.<br><br>This CR corrects the current shortcomings of the IPv6 stateless address autoconfiguration in 23.060, mainly by specifying that a different prefix shall be allocated to each PDP context that uses stateless address autoconfiguration.<br><br>This principle is recommended in the Internet-Draft "draft-wasserman-3gpp-advice-00.txt", which has been produced by a design team composed of IETF IPng experts that have investigated the use of IPv6 in the 3GPP architecture. It shall be noted that these experts do not believe that this principle could lead to an over-consumption of the vast IPv6 addressing space, as indicated in the Internet-Draft.<br><br>Note that the IETF IPng working group has adopted this Internet-Draft as working group item in the last IETF meeting (Dec 2001), with the intention to quickly progress it to the status of informational RFC. |
| ***Summary of change:*** | ⌘ | The IPv6 stateless address autoconfiguration procedure is modified to support allocation of a distinct prefix to each PDP context. |
| ***Consequences if not approved:*** | ⌘ | The support of IPv6 stateless address autoconfiguration in GPRS will not be aligned with the standard IETF mechanism and therefore risks not being compatible with future developments of IPv6 in IETF. |

| | | |
|---|---|---|
| ***Clauses affected:*** | ⌘ | 9.2.1.1 |
| ***Other specs affected:*** | ⌘ | ☐ Other core specifications ⌘<br>☐ Test specifications<br>☐ O&M Specifications |
| ***Other comments:*** | ⌘ | It shall be noted that only the UE and the GGSN are impacted by these changes. The SGSN remains untouched. |

### 9.2.1.1 Dynamic IPv6 Address Allocation

IPv6 address allocation is somewhat different from the IPv4 address allocation procedure. There are two possibilities to allocate the address for an IPv6 node – stateless and stateful autoconfiguration. The stateful address allocation mechanism needs a DHCP server to allocate the address for the IPv6 node. In the stateless autoconfiguration, the IPv6 node is more involved in the allocation of the address. In addition, the stateless autoconfiguration procedure does not need any external entity involved in the address autoconfiguration.

IPv6 stateful address autoconfiguration uses the standard External PDN Address Allocation procedure, as described in 3GPP TS 29.061 [27]. The GGSN informs the MS that it shall perform ~~requests~~ stateful address autoconfiguration by means of the Router Advertisements, as defined in RFC 2461[71]. For this purpose, the GGSN shall automatically and periodically send Router Advertisement messages towards the MS after a PDP context of type IPv6 is activated. The use of stateless or stateful address autoconfiguration is configured per APN.~~using an Access Point Name referring to that service.~~

In order to support the standard IPv6 stateless address autoconfiguration mechanism, as defined by the IETF, within the particular context of UMTS (point-to-point connections, radio resource efficiency, etc), the GGSN shall assign a prefix that is unique within its scope to each PDP context applying IPv6 stateless address autoconfiguration. The size of the prefix is according to the maximum prefix length for a global IPv6 address. This avoids the necessity to perform duplicate address detection at the network level for every address built by the MS. The GGSN shall not use the prefix advertised to the MS to configure an address on any of its interfaces.

To ensure that the link-local address generated by the MS does not collide with the link-local address of the GGSN, ~~support dynamic IPv6 address allocation by the PLMN operator,~~ the GGSN shall provide~~s a unique~~ an interface identifier (see RFC 2462 [69]) to the MS and the MS shall use this interface identifier to configure its link-local address. This is applicable for both stateful and stateless IPv6 address autoconfiguration. ~~This enables the MS to perform the IPv6 stateless autoconfiguration procedures to generate its full IPv6 address.~~ In case of stateless address autoconfiguration however, the MS can choose any interface identifier to generate addresses other than link-local, without involving the network. In particular, the SGSN and the GGSN are not updated with the actual address used by the MS, as the prefix alone identifies the PDP context.

Figure 1 illustrates the IPv6 stateless autoconfiguration procedure~~s for this case~~. The figure and its description show only the messages and actions specific to the IPv6 stateless address autoconfiguration procedure. For a complete description of the PDP Context Activation Procedure, refer to the corresponding clause.

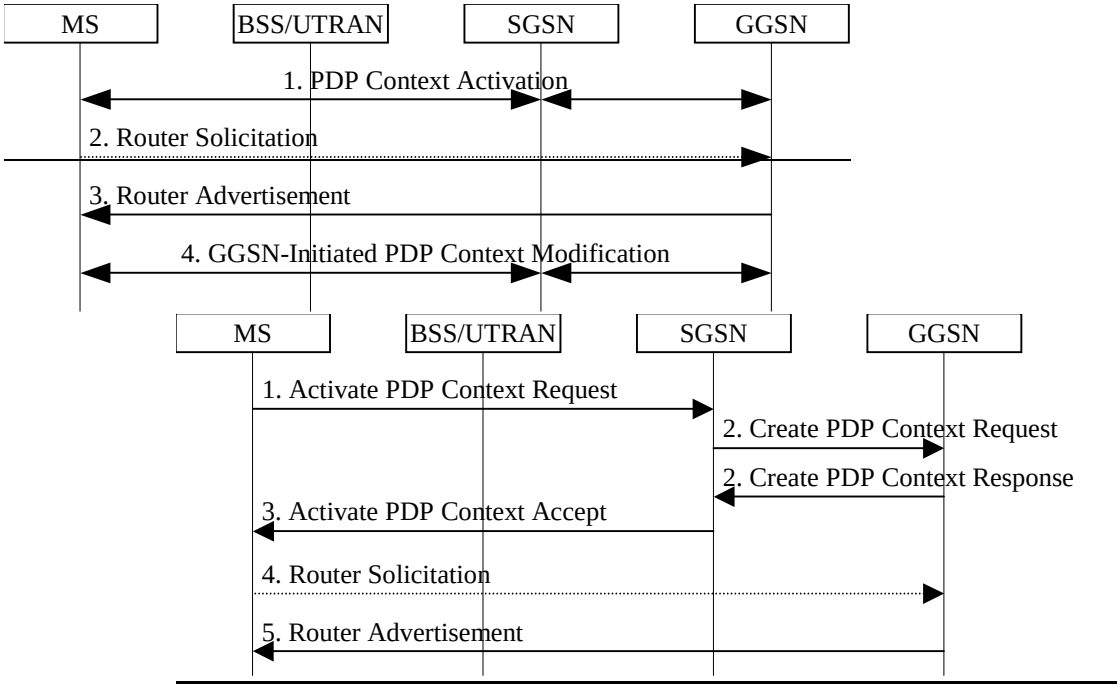


**Figure 1: IPv6 Stateless Address Autoconfiguration Procedure**

1) The MS sends an Activate PDP Context Request message to the SGSN~~. The procedure follows that~~ as defined in clause "PDP Context Activation Procedure"~~ with exceptions described below~~. The MS shall leave PDP Address empty and set PDP Type to IPv6.

~~The MS shall leave PDP Address empty and set PDP Type to IPv6.~~

2) Upon reception of the Create PDP Context Request, ~~T~~the GGSN ~~shall~~ create~~s~~ ~~the unique link-local~~ an IPv6 address composed of the prefix allocated to the PDP context and an interface identifier generated by the GGSN. ~~for the MS and send it~~ This address is then returned in the PDP Address information element in the Create PDP Context Response message. The processing of the Create PDP Context Request and Create PDP Context Response, in both the SGSN and the GGSN, is otherwise as specified in clause "PDP Context Activation Procedure".~~The link-local address consists of a fixed 10-bit prefix (IPv6-well-known link-local prefix), zero or more 0-bits, and the interface identifier.~~

NOTE: Since the MS is considered to be alone on its link towards the GGSN, the interface identifier does not need to be unique across all PDP contexts on any APN.

3) The MS receives the IPv6 address produced by the GGSN in the Activate PDP Context Accept. The MS extracts the interface identifier from the address received and stores it. The MS shall use this interface identifier to build its link-local address and may also use it for building its full IPv6 address, as describe in step 5. The MS shall ignore the prefix contained in the address received in the Activate PDP Context Accept. The processing of the Activate PDP Context Accept is otherwise as specified in clause "PDP Context Activation Procedure".

4~~2~~) The MS may send a Router Solicitation message to the GGSN to activate the sending of the Router Advertisement message.

5~~3~~) The GGSN ~~should automatically~~ send~~s~~ ~~the~~ a Router Advertisement message~~ after the PDP context is activated~~. The Router Advertisement messages shall contain the same prefix as the one provided in step 2. A given prefix shall not be advertised on more than one PDP context on a given APN, or set of APNs, within the same addressing scope. ~~In release 99 t~~The GGSN shall be configured to advertise only one ~~network~~ prefix per ~~APN~~PDP context.

After the MS has received the Router Advertisement message, it constructs its full IPv6 address by concatenating the interface identifier received in step 3~~ contained in the link-local address provided in the Create PDP Context Response Message in step 1~~, or a locally generated interface identifier, and the ~~network~~ prefix ~~of the selected APN~~ received in the Router Advertisement. If the Router Advertisement contains more than one prefix option, the MS shall only consider the first one and silently discard the others.~~Subsequently, the MS is ready to start communicating to the Internet.~~

NOTE: The MS can at any time change the interface identifier used to generate full IPv6 addresses, without involving the network, i.e. without updating the PDP context in the SGSN and the GGSN.

Because any prefix that the GGSN advertises in a PDP context is unique within the scope of the prefix (i.e. site-local or global)~~ provides a unique interface identifier during the PDP context activation procedure~~, there is no need for the MS to perform Duplicate Address Detection for this IPv6 address. Therefore, the GGSN shall ~~intercept and~~ silently discard Neighbor Solicitation messages that the MS may send to perform Duplicate Address Detection. It is possible for the MS to perform Neighbor Unreachability Detection towards the GGSN, as defined in RFC 2461[71]; therefore if the GGSN receives a Neighbor Solicitation as part of this procedure, the GGSN shall provide a Neighbor Advertisement as described in RFC 2461.

~~4) The GGSN updates the PDP context in the SGSN and MS with the full IPv6 address, see clause "GGSN-Initiated PDP Context Modification Procedure".~~