**Origination Date:** 8/27/97

**Originator:** AT&T

### Change Order Number: NANC 147

**Description:** Version ID Rollover Strategy

**Cumulative SP Priority, Average:** #6, 10.36

**Functional Backward Compatible:** YES

**IMPACT/CHANGE ASSESSMENT**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| FRS | IIS | GDMO | ASN.1 | **NPAC** | SOA | LSMS |
| Y | N | N | N | Low | None | None |

**Business Need:**

Currently there is no strategy defined for rollover if the maximum value for any of the id fields (sv id, lrn id, or npa-nxx id) is reached. One should be defined so that the vendor implementations are in sync. Currently the max value used by Lockheed is a 4 byte-signed integer and for Perot it is a 4 byte-unsigned integer.

**Sep ‘99 LNPA-WG** (Chicago), since the version ID for all data is driven by the NPAC SMS, the rollover strategy should be developed by Lockheed. SPs/vendors can provide input, but from a high level, the requirement is to continue incrementing the version ID until the maximum ([2\*\*31] –1) is achieved, then start over at 1 (**Jan/Mar/May ’07 LNPAWG mtgs** – it was mentioned that the reference here to “1” is confusing since that is not the decimal equivalent when a 32-bit number is rolled over, so instead of “1” the correct reference should say “minus [2\*\*31]”.), and use all available numbers at that point in time when a new version ID needs to be assigned (e.g., new SV-ID for a TN).

**Dec ’05 LNPAWG**: NeuStar provided a list of five record types that could have numbers that roll over (since they come across the interface). Local vendors have action item to determine if they will have a problem with numbers that come “out of order”.

**Description of Change:**

A strategy on how we look for conflicts for new version ids must be developed as well as a method to provide warnings when conflicts are found.

**Oct ‘98 LNPAWG** (Kansas City), it was requested that we begin discussing this in detail starting with the Jan 99 LNPAWG meeting. Beth will be providing some information on current data for the ratio of SV-ID to active TNs (so that we can get a feel for how much larger the SV-ID number is compared to the active TNs).

**Sep ‘99 LNPA-WG** (Chicago), Lockheed will begin developing a strategy for this.

**Jun ‘00 LNPA-WG** (Chicago), AT&T analysis and calculation (using current and projected porting volumes) indicate that a need for a version ID rollover strategy is more than five years away. Therefore, this change order is removed from R5, and will be discussed internally by NeuStar technical staff.

**Jul ‘00 LNPAWG**: NeuStar will track the problem. It will be a NeuStar internal design. Change order to stay on open list for possible later Document Only changes.

**Jan ‘06 LNPAWG**: Moved to accepted.

**Mar ‘06 LNPAWG**: Action IDs and Audit IDs are now expected to rollover in 7 months in the SE Region. NANC 147 will document the rollover strategy. There will be no initiative to go to 64 bit IDs.

**Sep ‘06 LNPAWG**: Action IDs and Audit IDs are now expected to rollover in less than two (2) months in the SE Region. Since these numbers are really transaction numbers and are purged on a regular basis, reuse is not an issue. The rollover strategy is to begin at 1. No vendor reported an issue with this approach. (**Jan/Mar/May ’07 LNPAWG mtgs** – it was mentioned that the reference here to “1” is confusing since that is not the decimal equivalent when a 32-bit number is rolled over, so instead of “1” the correct reference should say “minus [2\*\*31]”. As discovered during industry testing in early 2007, some vendors did have a problem with this; these vendors plan to address the problem with software patches to their customers).

NANC 147 is still needed to document the rollover strategy for long-term data (like SV-ID), where an inventory of available numbers needs to be established. At last check, this will be needed in ~850 months. NeuStar will continue to monitor the usage of SV-IDs.

Apr ‘11 LNPAWG – As a result of some discussion during Turn-Up and Group testing, clarifying text will be added to the documentation.

**Requirements:**

Req-1 NPAC SMS Record ID Maximum Value Rollover

NPAC SMS shall roll over a record ID attribute from the positive range to the negative range in instances when the ID reaches the maximum positive value of (2\*\*31)-1, and start with an ID that is equal to the minimum negative value of minus (2\*\*31).

Note: Record ID attributes include Audit ID, Action ID, Subscription Version ID, LRN ID, NPA-NXX ID, NPA-NXX-X ID, and Number Pool Block ID.

Note: NPAC operational considerations may roll over a record ID before it reaches the maximum positive value, minimum negative value, or maximum negative value.

Req-2 NPAC SMS Record ID Inventory Mechanism

NPAC SMS shall provide an inventory mechanism for persistent ID attributes (Audit ID, Action ID, Subscription Version ID, LRN ID, NPA-NXX ID, NPA-NXX-X ID, Number Pool Block ID) in instances when the ID reaches the maximum positive value of (2\*\*31)-1, and must roll over to the minimum negative value of minus (2\*\*31).

Note: NPAC operational considerations may roll over a record ID before it reaches the maximum positive value, minimum negative value, or maximum negative value.

Req-3 NPAC SMS Record ID Inventory – adding ID Values

NPAC SMS shall, after a roll over and thereafter, add ID values to the ID inventory for a specific persistent ID attribute (Audit ID, Action ID, Subscription Version ID, LRN ID, NPA-NXX ID, NPA-NXX-X ID, Number Pool Block ID) when that specific ID value **does not** exist in either the active database or history database, based on the frequency defined in the inventory mechanism in the housekeeping process.

Note: Available record ID values can change between housekeeping executions of the inventory mechanism (i.e., an SV-ID that is not available to be added to the inventory one month may be available to be added the next month).

Req-4 NPAC SMS Record ID Inventory – skipping ID Values

NPAC SMS shall, after a roll over and thereafter, skip ID values when adding to the ID inventory for a specific persistent ID attribute (Audit ID, Action ID, Subscription Version ID, LRN ID, NPA-NXX ID, NPA-NXX-X ID, Number Pool Block ID) when that specific ID value **does** exist in either the active database or history database, based on the frequency defined in the inventory mechanism in the housekeeping process.

Req-5 NPAC SMS Record ID Inventory – issuing new ID Values

NPAC SMS shall issue an ID value from the ID inventory for a specific persistent ID attribute (Audit ID, Action ID, Subscription Version ID, LRN ID, NPA-NXX ID, NPA-NXX-X ID, Number Pool Block ID) when creating a record that requires a new ID value, and the ID attribute has been rolled over.

Req-6 NPAC SMS Record ID Inventory – skipping ID Value of Zero

NPAC SMS shall, after a roll over and thereafter, skip ID value zero (0) when adding to the ID inventory for a specific persistent ID attribute (Audit ID, Action ID, Subscription Version ID, LRN ID, NPA-NXX ID, NPA-NXX-X ID, Number Pool Block ID), based on the frequency defined in the inventory mechanism in the housekeeping process.

IIS:

Section 2.3, SOA to NPAC Interface (and 2.4 NPAC SMS to Local SMS Interface)

Mapping of this functionality into the CMIP Definitions is provided in *Section 4 (see Exhibit 8.)* The NPAC SMS currently uses a 32-bit signed integer for the Naming ID Value. ID value interpretation is based on the way an LNP system treats binary integer numbers. Signed interpretation will see negative numbers when the 32nd bit is used. Unsigned interpretation will always see positive numbers.

Binary Signed Unsigned

Numbers Numbers Numbers

00000000000000000000000000000001 1 1

00000000000000000000000000000010 2 2

00000000000000000000000000000011 3 3

… … …

01111111111111111111111111111110 2147483646 2147483646

01111111111111111111111111111111 2147483647 2147483647

Rollover

10000000000000000000000000000000 -2147483648 2147483648

10000000000000000000000000000001 -2147483647 2147483649

10000000000000000000000000000010 -2147483646 2147483650

10000000000000000000000000000011 -2147483645 2147483651

… … …

11111111111111111111111111111101 -3 4294967293

11111111111111111111111111111110 -2 4294967294

11111111111111111111111111111111 -1 4294967295

Rollover Rollover

00000000000000000000000000000001 1 1

00000000000000000000000000000010 2 2

00000000000000000000000000000011 3 3

It is anticipated that all Service Providers will be able to successfully handle Naming ID Values up to this maximum. With the implementation of NANC 147, record IDs will be automatically rolled over when the ID exhausts the 32-bit values (or prior to for operational considerations). Using a signed interpretation, a “sign” rollover occurs when the ID increments from 31-bit to 32-bit.. Due to NPAC operational considerations, a record ID may roll over before it reaches the maximum value. For record IDs that are persistent (e.g., SV ID), an inventory mechanism will be used, such that IDs will be assigned in a non-contiguous sequence. With the inventory feature of the NPAC, IDs may be sent out of order such that large 32-bit values are sent by the NPAC followed by smaller 31-bit values.

GDMO:

Here is the current GDMO behavior for the following attributes:

* 8.0 – LNP Audit Discrepancy Version Id
* 32.0 – LNP Service Provider LRN ID
* 39.0 – LNP Service Provider NPA-NXX ID
* 50.0 – LNP Subscription Audit ID
* 99.0 – LNP Subscription Version Id
* 101.0 – LNP LSMS Filter NPA-NXX ID
* 122.0 – LNP Number Pool Block Id
* 137.0 – LNP Service Provider NPA-NXX-X ID

The NPAC SMS currently uses a 32-bit signed integer for the

Naming ID Value. The maximum value is ([2\*\*31] - 1) or 2147483647

and the minimum value is -(2\*\*31) or -214648648. Rollover will

take place when the ID reaches the maximum value (or prior to for

operational considerations). The next ID value after the maximum

of 214748647 will be -214748648.

It is anticipated that all Service Providers will be able to

successfully handle Naming ID Values within this range as well as

rollover after the maximum value is reached.

Here is the updated text.

The NPAC SMS uses a 32-bit signed integer for the

Naming ID Value. ~~The maximum value is ([2\*\*31] - 1) or 2147483647~~

~~and the minimum value is -(2\*\*31) or -214648648.~~

ID value interpretation is based on the way an LNP system treats

binary integer numbers.

Signed interpretation will see negative numbers when the 32nd bit is used.

Unsigned interpretation will always see positive numbers.

Binary Signed Unsigned

Numbers Numbers Numbers

00000000000000000000000000000001 1 1

00000000000000000000000000000010 2 2

00000000000000000000000000000011 3 3

… … …

01111111111111111111111111111110 2147483646 2147483646

01111111111111111111111111111111 2147483647 2147483647

Rollover

10000000000000000000000000000000 -2147483648 2147483648

10000000000000000000000000000001 -2147483647 2147483649

10000000000000000000000000000010 -2147483646 2147483650

10000000000000000000000000000011 -2147483645 2147483651

… … …

11111111111111111111111111111101 -3 4294967293

11111111111111111111111111111110 -2 4294967294

11111111111111111111111111111111 -1 4294967295

Rollover Rollover

00000000000000000000000000000001 1 1

00000000000000000000000000000010 2 2

00000000000000000000000000000011 3 3

Rollover will take place when the ID ~~reaches the maximum value~~ exhausts the 32-bit values (or

prior to for operational considerations). ~~The next ID value after the maximum~~

~~of 214748647 will be -214748648.~~ Using a signed interpretation,

a “sign” rollover occurs when the ID increments from 31-bit to 32-bit.

With the inventory feature of the NPAC, IDs may be sent out of order

such that large 32-bit values are sent by the NPAC followed by smaller

31-bit values.

It is anticipated that all Service Providers will be able to

successfully handle Naming ID Values within this 32-bit range as well as

rollover after the ~~maximum value is reached~~ 32-bit values are exhausted.

ASN.1:

No change required.