Change Order Form

**Origination Date** (mm/dd/yyyy): 10/4/2021

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**(NOTE: Originator(s) to complete this section of the form along with Sections 1, 2 and 3)**

1. **CO Name/Description: SPID Level Outbound Flow Control Tunables**

**Functional Backwards Compatible:** Yes

**IMPACT/CHANGE ASSESSMENT**

|  |  |  |
| --- | --- | --- |
| DOC | FRS | IIS |
| Y | Y |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| CMIP | GDMO | ASN.1 | **NPAC** | SOA | LSMS |
| N | N | Y | N | N |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| XML | XIS | XSD | **NPAC** | SOA | LSMS |
| Y | N | Y | N | N |

1. **Business Need:**

Currently the NPAC has one set of tunables for outbound flow control, which are specified at the system level. Having system tunables at the SPID level would allow for increased flexibility. Initially, these SPID-level tunables could be defaulted to different values for CMIP versus XML systems, as the two interface types have different aspects to consider as related to outbound flow control.

For example, the XML interface allows for batching of multiple requests (current maximum is 100) into a single XML document, and as such, a single XML document sent from the NPAC to a local system could instantaneously cause the NPAC to invoke outbound flow control processing for the local system. The CMIP interface does not support batching, and as such, it requires multiple protocol-level messages to be sent from the NPAC before outbound flow control processing is invoked.

While a new set of system tunables could be introduced to address the differences between the CMIP and XML interfaces, changing the tunables from system tunables to SPID-level tunables allows for the most flexibility going forward, including using different values for SOA systems versus LSMS systems.

1. **Description of Change:**

This change introduces four new SPID tunables for specifying outbound flow control upper and lower thresholds, with one pair of tunables for a SPID’s SOA and one pair of tunables a SPID’s LSMS. The existing system tunables for outbound flow control will be removed under this change.

**FRS:**

3.1.2 NPAC Customer Data

| **NPAC CUSTOMER DATA MODEL** | | | |
| --- | --- | --- | --- |
| **Attribute Name** | **Type (Size)** | **Required** | **Description** | |
| [snip] |  |  |  | |
| SOA Out-Bound Flow Control Upper Threshold | N(3) | √ | A numeric value that determines the number of non-responsive messages sent to a Service Provider SOA before Out-Bound Flow Control is invoked.  The default is 100. | |
| SOA Out-Bound Flow Control Lower Threshold | N(3) | √ | A numeric value that determines the number of non-responsive messages sent to a Service Provider SOA that is in a Flow Control state before normal processing is resumed.  The default is 75. | |
| LSMS Out-Bound Flow Control Upper Threshold | N(3) | √ | A numeric value that determines the number of non-responsive messages sent to a Service Provider LSMS before Out-Bound Flow Control is invoked.  The default is 100. | |
| LSMS Out-Bound Flow Control Lower Threshold | N(3) | √ | A numeric value that determines the number of non-responsive messages sent to a Service Provider LSMS that is in a Flow Control state before normal processing is resumed.  The default is 75. | |
| [snip] |  |  |  | |

R4-8 Service Provider Data Elements

NPAC SMS shall require the following data if there is no existing Service Provider data:

[snip]

SOA Out-Bound Flow Control Upper Threshold

SOA Out-Bound Flow Control Lower Threshold

LSMS Out-Bound Flow Control Upper Threshold

LSMS Out-Bound Flow Control Lower Threshold

**6.9 Out-Bound Flow Control**

Note: This sub-section applies to both the CMIP interface and the XML interface.

**~~RR6-148 Out-Bound Flow Control Upper Threshold Tunable~~**

~~NPAC SMS shall provide an Out-Bound Flow Control Upper Threshold tunable parameter which is defined as the number of non-responsive messages sent to a SOA/LSMS before Out-Bound Flow Control is invoked, on a per association basis. (previously NANC 368, Req 1)~~

**~~RR6-149 Out-Bound Flow Control Upper Threshold Tunable Default~~**

~~NPAC SMS shall default the Out-Bound Flow Control Upper Threshold tunable parameter to 100 messages. (previously NANC 368, Req 2)~~

**~~RR6-150 Out-Bound Flow Control Upper Threshold Tunable Modification~~**

~~NPAC SMS shall allow NPAC Personnel, via the NPAC Administrative Interface, to modify the Out-Bound Flow Control Upper Threshold tunable parameter. (previously NANC 368, Req 3)~~

**~~RR6-151 Out-Bound Flow Control Lower Threshold Tunable~~**

~~NPAC SMS shall provide an Out-Bound Flow Control Lower Threshold tunable parameter which is defined as the number of non-responsive messages sent to a SOA/LSMS that is in a Flow Control state before normal processing is resumed, on a per association basis. (previously NANC 368, Req 4)~~

**~~RR6-152 Out-Bound Flow Control Lower Threshold Tunable Default~~**

~~NPAC SMS shall default the Out-Bound Flow Control Lower Threshold tunable parameter to 75 messages. (previously NANC 368, Req 5)~~

**~~RR6-153 Out-Bound Flow Control Lower Threshold Tunable Modification~~**

~~NPAC SMS shall allow NPAC Personnel, via the NPAC Administrative Interface, to modify the Out-Bound Flow Control Lower Threshold tunable parameter. (previously NANC 368, Req 6)~~

The production values for the tunables listed in the requirements below may differ from the default values depending on whether the SOA or LSMS system uses a CMIP interface or an XML interface. Actual production values used for each system type and interface type will be defined in the appropriate M&P document.

**R1 Service Provider SOA Out-Bound Flow Control Upper Threshold Tunable**

NPAC SMS shall provide a Service Provider SOA Out-Bound Flow Control Upper Threshold tunable parameter which is defined as the number of non-responsive messages sent to a Service Provider SOA (per association for CMIP, per primary SPID for XML) before Out-Bound Flow Control is invoked.

**R2 Service Provider SOA Out-Bound Flow Control Upper Threshold Tunable Default**

NPAC SMS shall default the Service Provider SOA Out-Bound Flow Control Upper Threshold tunable parameter to 100 messages.

**R3 Service Provider SOA Out-Bound Flow Control Upper Threshold Tunable Modification**

NPAC SMS shall only allow NPAC Personnel, via the NPAC Administrative Interface, to modify the Service Provider SOA Out-Bound Flow Control Upper Threshold tunable parameter.

**R4 Service Provider SOA Out-Bound Flow Control Lower Threshold Tunable**

NPAC SMS shall provide a Service Provider SOA Out-Bound Flow Control Lower Threshold tunable parameter which is defined as the number of non-responsive messages sent to a Service Provider SOA (per association for CMIP, per primary SPID for XML) that is in a Flow Control state before normal processing is resumed.

**R5 Service Provider SOA Out-Bound Flow Control Lower Threshold Tunable Default**

NPAC SMS shall default the Service Provider SOA Out-Bound Flow Control Lower Threshold tunable parameter to 75 messages.

**R6 Service Provider SOA Out-Bound Flow Control Lower Threshold Tunable Modification**

NPAC SMS shall only allow NPAC Personnel, via the NPAC Administrative Interface, to modify the Service Provider SOA Out-Bound Flow Control Lower Threshold tunable parameter.

**R7 Service Provider LSMS Out-Bound Flow Control Upper Threshold Tunable**

NPAC SMS shall provide a Service Provider LSMS Out-Bound Flow Control Upper Threshold tunable parameter which is defined as the number of non-responsive messages sent to a Service Provider LSMS (per association for CMIP, per SPID for XML) before Out-Bound Flow Control is invoked.

**R8 Service Provider LSMS Out-Bound Flow Control Upper Threshold Tunable Default**

NPAC SMS shall default the Service Provider LSMS Out-Bound Flow Control Upper Threshold tunable parameter to 100 messages.

**R9 Service Provider LSMS Out-Bound Flow Control Upper Threshold Tunable Modification**

NPAC SMS shall only allow NPAC Personnel, via the NPAC Administrative Interface, to modify the Service Provider LSMS Out-Bound Flow Control Upper Threshold tunable parameter.

**R10 Service Provider LSMS Out-Bound Flow Control Lower Threshold Tunable**

NPAC SMS shall provide a Service Provider LSMS Out-Bound Flow Control Lower Threshold tunable parameter which is defined as the number of non-responsive messages sent to a Service Provider LSMS (per association for CMIP, per SPID for XML) that is in a Flow Control state before normal processing is resumed.

**R11 Service Provider LSMS Out-Bound Flow Control Lower Threshold Tunable Default**

NPAC SMS shall default the Service Provider LSMS Out-Bound Flow Control Lower Threshold tunable parameter to 75 messages.

**R12 Service Provider LSMS Out-Bound Flow Control Lower Threshold Tunable Modification**

NPAC SMS shall only allow NPAC Personnel, via the NPAC Administrative Interface, to modify the Service Provider LSMS Out-Bound Flow Control Lower Threshold tunable parameter.

Table C– -- Subscription Tunables

| **Communications Tunables** | | | |
| --- | --- | --- | --- |
| **Tunable Name** | **Default Value** | **Units** | **Valid Range** |
| [snip] | | | |
| **~~Out-Bound Flow Control Upper Threshold Tunable~~** | ~~100~~ | ~~Messages~~ | ~~50 – 500~~ |
| ~~The number of non-responsive messages sent to a SOA/LSMS before Out-Bound Flow Control is invoked.~~ | | | |
| **~~Out-Bound Flow Control Lower Threshold Tunable~~** | ~~75~~ | ~~Messages~~ | ~~1 – 500~~ |
| ~~The number of non-responsive messages sent to a SOA/LSMS that is in a Flow Control state before normal processing is resumed, on a per association basis.~~ | | | |
| [snip] | | | |

**IIS:**

5.4.3 Out-Bound Flow Control

Under normal conditions the NPAC SMS sends messages to the associated SOA/LSMS and the SOA/LSMS is able to keep up with the NPAC, and Flow Control is not encountered. However, under load conditions, the SOA/LSMS is not able to keep up with the messages sent from the NPAC SMS and Flow Control may be encountered.

For a SOA/LSMS that is currently in a normal state (not in Flow Control), the NPAC SMS monitors the number of outstanding, non-responsive messages sent to that system. If the number of outstanding, non-responsive messages is less than the Flow Control Upper Threshold (tunable value for each primary SPID and system type), NPAC sends the current message it is handling, and continues with normal processing. If the number of outstanding, non-responsive messages is equal to the Flow Control Upper Threshold tunable, the NPAC sends the current message it is handling, and sets the Flow Control flag to TRUE. In this situation Flow Control is encountered.

During Flow Control the NPAC SMS verifies the Flow Control flag setting for the destination SOA/LSMS to determine if it’s OK to send each message. If the flag is FALSE, the message is sent; if the flag is TRUE the message is held/queued. In a Flow Control state, the NPAC SMS monitors the number of outstanding, non-responsive messages sent to that SOA/LSMS. If the number of outstanding, non-responsive messages is greater than the Flow Control Lower Threshold (tunable value for each primary SPID and system type), no action is taken. When the number of outstanding, non-responsive messages is less than or equal to the Flow Control Lower Threshold ~~(tunable value)~~, the NPAC SMS resumes sending messages (whether queued or normal). A SOA/LSMS that is in a Flow Control state will have outstanding, non-responsive messages. For all outstanding, non-responsive messages that were sent, NPAC response timers and abort behavior will apply. For all messages NOT sent but held because the Flow Control flag is set to TRUE, NPAC response timers and abort behavior will NOT apply.

Flow Control is implemented on the NPAC SMS side of the CMIP interface and it is optionally implemented on the SOA/LSMS. The implementation of Flow Control by the sending system is independent of any implementation of Flow Control by the receiving system and is applicable on a per association basis. Flow Control applies to both normal mode and recovery mode and is applicable for service provider, network, number pool block, subscription version and notification data.

**XIS:**

**2.8 Out-Bound Flow Control**

Out-Bound Flow Control is a mechanism used by the NPAC to ensure that it is not delivering messages to a local system faster than that local system can process the messages. Under normal conditions the NPAC SMS sends messages to the SOA/LSMS and the SOA/LSMS is able to keep up with the NPAC, and Flow Control is not encountered. However, under certain conditions (e.g. high volume or problems in the local system) that cause the SOA/LSMS to be unable to keep up with the messages sent from the NPAC SMS, Flow Control may be engaged.

For a SOA/LSMS that is currently in a normal state (not in Flow Control), the NPAC SMS monitors the number of outstanding messages (where the NPAC is awaiting an asynchronous reply) for that system. While the number of outstanding messages is less than or equal to the Flow Control Upper Threshold (tunable value for each primary SPID and system type), the NPAC will continue to send to the system. Once the number of outstanding messages is greater than the Flow Control Upper Threshold tunable, the NPAC engages Flow Control for the system, and no new messages are sent to the system.

Once a system enters Flow Control, it will remain in Flow Control until the system replies to enough of the outstanding messages that the total number of outstanding messages reaches the Flow Control Lower Threshold (tunable value for each primary SPID and system type).

When a SOA/LSMS is in a Flow Control state the NPAC will hold both outstanding messages and deferred messages (messages that have not been delivered because the system is in Flow Control). For all outstanding messages that were sent, NPAC response timers will apply and messages will be resent when they expire. For all messages NOT sent but held because the system is in Flow Control, the NPAC response timers will NOT be started.

Note that Flow Control only applies to new messages and does not apply to asynchronous reply messages. For example, a SOA system that is in Flow Control will still be able to send requests to the NPAC, and will still receive asynchronous replies from the NPAC, but it will not receive new message from the NPAC such as Notifications and downloads. Also, ProcessingError and application level KeepAlive messages are sent even when a system is in Flow Control.

Flow Control is implemented on the NPAC SMS side of the XML interface and it is optionally implemented on the SOA/LSMS. The implementation of Flow Control by the sending system is independent of any implementation of Flow Control by the receiving system and is applicable on a per system basis.