SEC Modification Proposal, MP119

DCC CR1400

Communications Hub Alert Consolidation

**DCC Preliminary Impact Assessment**

|  |  |
| --- | --- |
| Version: | 1.3 |
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| Author: | DCC |
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# Executive Summary

The Change Board are asked to approve the following:

* Total cost to complete the Full Impact Assessment of £236,721
* The timescales to complete the Full Impact Assessment of 60 days
* ROM costs for MP119, up to the end of Pre-Integration Testing (PIT) of £2,950,000.

MP119 proposes the implementation of a Communications Hub Alert Consolidation mechanism with the objective of controlling alert storm traffic across the CSP networks.

Alert Storms are caused by a device entering a state whereby it repeatedly either generates or causes the generation of an alert at a rate that was not anticipated or intended.

Currently Device Alert Storms are generating large numbers of alerts which are impacting CSP Network and Communications Hub performance. The Alert Storms can impact the performance of a CSP Network overall, slowing or even stopping the flow of other messages across a Network and possibly causing an outage.

The proposed changes would implement an alert storm identification and consolidation mechanism within SMETS2 Communications Hubs, enabling the hubs to not send every such alert through the wide area network, hence reducing network traffic and resource use. This would be complementary to the Alert Storm Protection mechanism already implemented by the DSP through SECMP0062 and would provide protection for the CSP Domains.

The DSP, CSP North, CSP Central and South are impacted by this change. The main beneficiary of the change is CSP North, where it would reduce the risk of overload of their network and also enable them to remove a GBCS non-compliance (that is in direct response to alert overloads). Both CSP’s have been requested to impact this change to maintain functional equivalence across all Communications Hubs and avoid any divergence. The CSPs have highlighted in their responses that this Modification addresses the symptom of alert storms not the root cause, and that to address the root cause would require HAN devices to perform this alert consolidation.

This is the first version of this Preliminary Impact Assessment.

The total ROM costs to deliver MP119 are £2,950,000, which includes Design, Build and PIT, and a tolerance of ±20%.

The cost to prepare a Full Impact Assessment are quoted at £236,721. The Change Board are asked to also approve that the FIA will take 50 days to complete which is 10 days more that the current Service Level Agreement (SLA) of 40 days.

# Introduction

## Revision History

| Revision Date | Revision | Summary of Changes |
| --- | --- | --- |
| 16/11/2020 | 0.1 | Initial version |
| 18/11/2020 | 0.2 | Updated format, amended Exec Summary, created separate Code Red Annex |
| 25/11/2020 | 1.1 | Minor edits |
| 09/12/202 | 1.2 | Minor updates from review with SECAS |
| 16/12/2020 | 1.3 | Additional clarifications |

## Associated Documents

This document is associated with the following documents:

| Ref | Title and Originator’s Reference | Source | Issue Date |
| --- | --- | --- | --- |
| 1 | MP119 ‘CH Alert Storm Consolidation’ Business Requirements – version 0.4 | SECAS |  |

References are shown in this format, [1].

## Document Information

The proposer for this Modification is Graeme Liggett of DCC. The original proposal was submitted in March 2020.

This Preliminary Impact Assessment was requested of DCC on 20th July 2020.

# Context and Requirements

## Problem Statement

Device Alert Storms are generating large numbers of alerts which are impacting CSP Network and Communications Hub performance.

CSP North have presented this issue and have proposed changes to HAN Devices and Communications Hubs at the appropriate industry forums, with changes to both HAN Devices and Communications Hubs required for complete coverage. The proposed changes would “localise” the impact of Alerts to the HAN and Communications Hubs. Changes to the behaviour of HAN Devices are anticipated to require additional investigation and would take an extended period to be implemented. Changes to Communications Hubs is thought to be a quicker first path, providing protection whilst device manufacturers implement a mechanism and would continue to provide protection against negative device scenarios.

The Modification proposed seeks to implement an alert storm identification and consolidation mechanism within SMETS2 Communications Hubs; enabling the hubs to not send every such alert through the wide area network, reducing network traffic and resource use.

This would be complementary to the Alert Storm Protection mechanism already implemented by the DSP that is providing protection for the DSP Solution and Service Users and would provide protection for the CSP Domains.

## Business Requirements

The requirements for this modification have been developed by the Working Group during the Refinement phase. The impact on DCC has been assessed against the Business Requirements.

Business Requirement 1

*A mechanism will be included within the Communications Hub (CH) to prevent the onward transmission of alert storms to the Wide Area Network.*

The mechanism to be included within the CH will provide multi-level protection for DCC Users against Alert Storms. It has been identified that the root cause of Alert Storms is at the Home Area Network (HAN) and CH level. This will enable Alert filtration to take place before reaching the DSP.

Business Requirement 2

*The Communications Hub will identify when a Device/Alert code combination exceeds a defined threshold.*

The threshold is based on a count within a rolling time period. This will be determined using configuration parameters in a similar manner to SECMP0062. An initial example is shown in the table below:

| Example Parameters | | |
| --- | --- | --- |
| Configuration Parameter | Example Value |  |
| Alert Code Specific Rolling Window (time period) | 60 minutes | Yes |
| Alert Code Specific Threshold | 20 | Yes |
| Alert Storm Protection Discarded Alert Limit (1 in N) | 500 | Yes |
| Alert Storm Protection Maximum Time Limit | 1440 minutes | Yes |
| Alert Storm Protection Deadband Period | 24 hours | No |
| Alert Storm Protection Exclusion List (example) | To be agreed and based on solution options | Yes |

Business Requirement 3

*When a threshold is exceeded the CH will begin consolidating the specific Device/Alert code.*

Alerts will be consolidated on a per Alert code basis when a specified Alert is exceeded. Under the consolidation rules only 1 in *n* alerts will be transmitted via the Wide Area Network (WAN) interface. These forwarded Alerts will be accompanied by additional metadata that indicates the count of forwarded Alerts (*ThrottledAlertSequenceId*) and the number of Alerts that have been consolidated since the last forwarded Alert (*ThrottledAlertCount*).

Business Requirement 4

*Both DCC and Service Users require to be informed when Device Alerts are being consolidated.*

This can be achieved through the existing DUIS functionality for consolidated alerts, no additional changes to DUIS would be required.

Business Requirement 5

*Users require a reporting and notification mechanism.*

User reports will be generated in a similar format to those for SECMP0062 Alert Storm Consolidation.

Business Requirement 6

*Reporting for MP119 and SECMP0062 shall be provided separately.*

Providing separate reports will give greater clarity for SEC Parties as it will be clear to see at what level Alerts are being consolidated.

Business Requirement 7

*MP119 solution to include an Alert exclusions list*.

The Communications Hub will contain a list of Alerts that will not be subject to this mechanism. This list should be capable of being updated at any time and will not be hard-wired into the System.

The list of Alerts that will be exempted from filtration or subject to different levels of throttling will be determined later. Once in place, this will be monitored and amended by the SEC Operations Group. The governance will be determined during the Refinement Process.

# Benefits and Business Case

|  |  |
| --- | --- |
| Organisation | Benefit |
| DCC | Reduced alert traffic across the CSP networks, providing better utilisation and reducing any likelihood of network capacity increases being required |
| DSP | Reduced incoming alert traffic |
| CSPN | Reduce the risk of a CH alert buffer overflowing and consequent loss of alerts  Reduce the risk of tower uplink channel saturation.  Would resolve current GBCS non-compliance for GPF 8F3E alerts. |
| CSPC&S | CSPC&S has expressed the view that they are not experiencing capacity issues at the Comms Hub or WAN level and question the benefit of this change |
| Service Users | None |

Table 1 – Benefits

The Business Case will be elaborated as part of the Final Impact Assessment.

## Additional Information

Both CSP’s have commented that this modification proposal does not address the root cause of alert storms, and that to do so would require HAN devices to consolidate their own alerts.

The problem was raised by CSP North in TSIRS on the 14th November 2019 where two solution options were discussed.

Option 1 – Consolidate alerts on the HAN device that is generating the alert

Option 2 - Consolidate alerts on the Comms Hub

It was considered that while alert consolidation at the HAN Device was the better solution this would likely take longer to implement due to the impact on all manufacturers, but that this option should be considered by Industry for progression. DCC would be engaged in progressing Comms Hub alert consolidation.

# Impacted Domains

The impacted domains have been identified as follows:

|  |  |
| --- | --- |
| Domain | Impact Summary |
| CSPN | CSPN Communications Hub  CSPN Core Systems  CSPN WAN Gateway |
| CSPC&S | CSPC&S Communications Hub  CSPC&S Core Systems  CSPC&S WAN Gateway |
| DSP | CSP WAN Gateways  Alert Processing  Alert Storm Protection  Reporting |
| DCC | Reporting |
| Service Users | Additional DCC Reports will be received |

Table 2

Both CSP’s have been requested to impact this change to maintain functional equivalence across all Communications Hubs and avoid any divergence.

# Impact on DCC’s Systems, Processes and People

This section describes the overall solution and the impact of MP119 on DCC’s Services and Interfaces that impact Users and/or Parties.

## Description of Solution

This modification proposes the implementation of a mechanism within the SMETS2 Communications Hubs that will detect repeated identical alerts and by using consolidation avoid the consequential unnecessary consumption of network resource promoting efficient use of the Smart Metering network.

The Communications Hub will count alerts (by alert code) as they are received. If the number of a specific alert code counted within a given time window exceeds a threshold level, then it will be marked as ‘overloaded’ and consolidation will then begin for that alert code.

Consolidation will operate by only forwarding one in N of these ‘overloaded’ alerts (where N is a configurable number) via its WAN (Wide Area Network) interface. Thus, reducing the alert traffic that the Communications Hub is required to generate and that the CSP Network is required to carry.

It will be possible to exclude specific alert codes from being consolidated.

As per Business Requirement 2, it was originally intended that there be a list of alert codes that would be excluded from consolidation. However, feedback from the Service Providers highlights that a more efficient (from a Comms Hub perspective) approach would be to have a list of alerts to be **included** by the consolidation mechanism, i.e. consolidation would only take place for those alerts codes in the inclusion list. There are therefore two options:

1. An alert **exclusion** list
2. An alert **inclusion** list

DCC recommends Option B – Alert Inclusion List

Operation of the consolidation mechanism will be controlled by means of configuration parameters within the Communications that may be updated remotely.

Consolidated alert messages sent by the Communications Hub will include two additional metadata fields: *‘Throttled Sequence ID’* and ‘*Throttled Alert Count’.* The presence of these two fields will inform the upstream DSP System that this is a consolidated alert. The DSP will integrate the CH consolidated alerts with the DSP alert consolidation mechanism. This will provide data to the DSP that is used to inform Service Users via SSI and DUIS, and for use in reporting by both DSP and DCC.

### Configuration Parameters

The table below details the proposed configuration parameters to be used within the Communications Hub. Note that the example values given here are different to those in Business Requirement 2, and are the current recommended values following discussions with the Service Providers.

|  |  |  |
| --- | --- | --- |
| Parameter | Description | Example Value |
| Alert Code Specific Rolling Window | The count of each specific alert code within a rolling time window – so only alerts occurring within that time window will be counted | 60 minutes |
| Alert Code Specific Threshold | A threshold value for the alert code specific count. When the threshold is exceeded for a specific alert this will trigger the consolidation of that alert | 60 |
| Alert Storm Protection Discarded Alert Limit | When an alert is being consolidated, a count of the discarded alerts will be maintained. When the count exceeds this parameter then that alert will be forwarded to the normal recipient, after which the count of consolidated alerts begins again. This is also referred to as the ‘1 in N’ value. | 500 |
| Alert Storm Protection Maximum Time Limit | When an alert is being consolidated, if no new alert has been received within the maximum time limit, then the next alert received will be forwarded regardless of whether the discarded alert limit has been reached or not | 1440 minutes |
| Alert Storm Protection Deadband Period | If consolidation has been triggered for a specific alert, and the rate of that alert then drops below the Alert Code Specific Threshold, then the Comms Hub will continue to consolidate instances of that alert until the rate remains below the threshold value for greater than the deadband period | 1440 minutes |
| Alert Code List | A list of specific alert codes that for:  Option A – will be excluded from consolidation  Option B – will be included in consolidation |  |

Table 3

## Impact on CSPN

Design, build, and system test modifications to the CSP North Communications Hub for all currently produced Communications Hubs.

Design, build, and system test modifications to the CSP North solution such that:

* A DCC provided configuration file will be made available for the configuration to be applied to every Production Communications Hub.
* Communications Hub configuration settings will be applied to every Production Communications Hub
* The SD4.4.1 SMWAN Gateway Interface will be modified to include the additional metadata fields for the consolidated device alerts (see DSP Solution section).

## Impact on CSPC&S

Design, build, and system test modifications to the CSP Central and South Communications Hub for all currently produced Communications Hubs.

Design, build, and system test modifications to the CSP Central and South solution such that:

* A DCC provided configuration file will be made available for the configuration to be applied to every Production Communications Hub.
* Communications Hub configuration settings will be applied via the AutoRTT mechanism.
* Additional alert attributes for the consolidated GBCS device alerts will be notified to the CSP reporting platform.
* The SD4.4.2 SMWAN Gateway Interface will be modified to include a new message for the consolidated device alerts (see DSP Solution section)

CSPC&S has raised specific concerns regarding the value of this change without addressing the root cause of the alerts being generated by HAN devices, and the potential risk of Communications Hub performance impact.

## DSP Solution

Within the Alert Storm Protection mechanism within the DSP they record information about the throttling of the Device Alerts in a log named Traffic Management Overload Logs. Additionally, two optional fields named *‘Throttled Sequence ID’* and ‘*Throttled Alert Count’* were introduced to Device Alerts and DCC Alerts within DUIS in order to share the Alert Storm protection data with the Service Users.

The objective of MP119 is to build a mechanism to consolidate Device Alerts within the Comms Hubs. This PIA expects that the consolidation of Alerts at the Comms Hubs shall be done without requiring any changes to DUIS to avoid changes to the Service Users. Regardless of where the consolidation happens between the Comms Hubs and the DSP, the behaviour of DCC Data Systems shall remain the same for the Service Users.

DSP proposes the following solution that minimises the amount of changes to existing processing to offer better value for money:

DSP will enhance the existing Alert Storm protection processing within DSP to incorporate the outcome of the Alert Storm Protection within Comms Hub. The Alerts received from the Comms Hubs/CSP are expected to contain the following additional metadata to indicate that an active Alert Storm protection is in progress within a Comms Hub:

* Throttle Alert Sequence ID;
* Throttle Alert count.

The CSP Gateways will map the above metadata received from the Comms Hub/CSP into the existing fields that are ordinarily populated when DSP performs Alert Storm protection. The key functional changes are as follows:

1. The metadata received from the Comms Hub/CSP will be added to the Traffic Management Overload logs at the CSP Gateway, with an additional flag in those logs to differentiate Comms Hub/CSP consolidation from DSP consolidation. This additional flag will allow the TOC to determine the layer at which the Alert consolidation took place;
2. The metadata received from the Comms Hub/CSP will be included in the DCC Alert/Device Alert that heads northbound to the Service User.

Note: Where Alerts are discarded by DSP, the discarded Alerts are counted within DSP Anomaly Detection; where Alerts have been consolidated at the Comms Hub the discarded Alerts will not be counted in DSP Anomaly Detection.

In order to receive the additional metadata from the Comms Hub/CSP the CSP SMWAN Interface will need to be updated. The actual changes shall be discussed and agreed with the CSPs. However, for the purpose of this PIA, the following assumptions have been made regarding the interfaces:

1. CSP Central and South SMWAN Interface - New message type in UDP packet for Device Alerts that includes additional metadata;
2. CSP North SMWAN Interface - New fields in the JSON message for CSP North to provide the additional metadata.

SSI provides a dashboard for the Service Users to view the Alerts and the Devices that are affected by Alert Storm Protection managed within DSP. The dashboard allows the Service Users to view the metrics over a period; and this is possible because the consolidation start time and end time are determined/recorded by DSP. When the consolidation happens within the Comms Hub, the duration between the current and previous Device Alerts will not be known to DSP, but it is a key piece of data for the dashboard. To achieve this an additional tracking mechanism within DSP will be created that records the timestamp of Device Alerts, which can then be deducted from the timestamp of the subsequent Alerts of the same type from the same Device. This introduces additional counters and associated housekeeping requirements.

## Impact on DCC

DCC will provide additional reports detailing the alert storms that are being consolidated at the Communications Hub level.

## Impact on Service Users

Information relating to alert storms being consolidated at Communications Hub level will be made available through two mechanisms:

* Self Service Interface
* DCC Reporting

For both, alerts being consolidated at the Communications Hub will be identified separately to those from DSP consolidation.

No changes are proposed to DUIS and alerts consolidated at either the Communications Hub or DSP will be identified in the same way using the additional consolidation metadata.

## Technical Specifications

No changes to DUIS or GBCS will be required.

## Impact on the SEC

This will be provided as part of the Full Impact Assessment.

# Impact on Security

A detailed Security impact will be carried out as part of the Full Impact Assessment.

# Testing Considerations

This section outlines the testing required to complete the Design, Build and Test phases for this SEC Modification.

## Pre-integration Testing

During Pre-Integration Testing (PIT), each Service Provider tests its own solution to agreed standards in isolation of other Service Providers. Specifically, the development team will carry out unit testing and the build will be subject to continuous build and automated testing to identify build issues at the earliest opportunity.

PIT will operate as a single phase of activity with a single drop. It will consist of a defined subset of system tests being observed by DCC.

## Systems Integration Testing

Systems Integration Testing (SIT) is the testing of the DCC Total System, which brings together the components, e.g., DSP and CSP Systems, to allow testing of the end-to-end solution by DCC. SIT is carried out for every DCC System release and incorporates the test and integration of multiple changes. The SEC Modification and associated system changes will need to be demonstrated and tested as part of the integration test phases.

## User Integration Testing

User Integration Testing (UIT) is referred to as User Testing in the SEC. User Testing of Modification Proposals is provided using the Modification Implementation Testing Service. It enables Users to run specific tests to support their implementation of a change. DCC expects that User Testing will be required to support User’s implementation of this modification.

# Implementation Timescales and Releases

## Change Lead Times

From the date of approval, (in accordance with Section D9 of the SEC), in order to implement the changes proposed DCC requires a lead time of **12 months.**

# DCC Costs and Charges

## Cost Impact

### Implementation Costs

The table below details the cost of delivering the changes and Services required to implement this Modification Proposal.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Implementation costs | | | | | | | |  |
| Phase: | **Design** | **Build** | **PIT** | **SIT** | **UIT** | **Implementation to Live** | **Total** | |
| MP109 | £2,751,000 to £2,950,000 | | |  | | | **£2,751,000 to £2,950,000** | |
| Implementation costs – supplementary information | | | | | | | | |
| Implementation cost assumptions | 1. *Costs are exclusive of VAT and any applicable finance charges* 2. *Majority of the costs above represent labour costs.* 3. *Costs provided for Design, Build and Pre-Integration Testing are quotes provided by the Service Providers and assuming there is no scope change can be considered the final costs. DCC have reviewed and challenged the costs from the Service Providers to ensure this reflects best price to date.* 4. *Costs will be refined during future assessments.* | | | | | | | |
| Explanation of Implementation Phases | *DCC’s implementation costs are provided by implementation phases. The following describes the purpose of each phase:*   * *Design: The production of detailed System and Service design to deliver all new requirements.* * *Build: The development of the designed Systems and Services to create a solution (e.g. code, systems, or products) that can be tested and implemented.* * *Pre-integration Testing: Each Service Provider tests its own solution to agreed standards in isolation of other Service Providers. This is assured by DCC.* * *System Integration Testing: All Service Providers’ PIT-complete solutions are brought together and tested as an integrated solution, ensuring all Service Provider solutions align and operate as an end to end solution.* * *User Integration Testing: Users are provided with an opportunity to run a range of pre-specified tests in relation to the relevant change.* * *Implementation to Live Costs: The solution is implemented into production environments and ready for use by Users as part of a live service. This service is subject to implementation costs.* | | | | | | | |

**The fixed price cost for a Full Impact Assessment is £236,721** and would be completed in 50 days.

DSP and CSP Central and South have indicated that they can provide a Full Impact Assessment within 30 days.

CSP North has indicated that they can provide a Full Impact Assessment within 50 days.

## Impact on Charges

This section describes the potential impact on Charges levied by DCC in accordance with the SEC.

DCC notes that MP119 does not propose any changes to the charging arrangements set out in SEC Section K. DCC has made the assumption that, in the absence of an agreed alternative arrangement by the Working Group, the costs associated with the implementation of MP119 will be allocated to DCC’s fixed cost based and passed through to Parties via Fixed Charges.

Subject to the commercial arrangements put in place to support the relevant Release, DCC expects the increase in Charges associated with the implementation of MP119 to commence in the month following the modification’s implementation.

# RAID

## Risks

|  |  |  |
| --- | --- | --- |
| Ref. | Risk Description | Risk Impact |
| R-001 | This change will increase the complexity of the Communications Hub and the additional resource consumption (e.g. CPU and Memory) may potentially cause a reduction in performance | High |
| R-002 | There is a risk that using an alert ‘Exclusion’ list rather than an ‘Inclusion’ list for consolidation may cause a reduction in Communications Hub performance as it would be required to parse every alert. | High |

## Assumptions

|  |  |  |
| --- | --- | --- |
| Ref. | Description | Impact |
| A-001 | No changes will be required to DUIS | High |
| A-002 | CH Configuration parameters would be loaded via a CSP specific mechanism, not via new DUIS defined Service Requests | High |
| A-003 | No changes will be made to the GBCS Alert payload | High |
| A-004 | It is assumed that the proposed functionality will be implemented across all SMETS-2 Communications Hubs in order to avoid any divergence between models | Medium |

## Dependencies

|  |  |  |
| --- | --- | --- |
| Ref. | Description | Impact |
| D-001 | None identified | n/a |