| SCIAMACHY | Operation Change Request | OCR No: 018<br>Issue: A |
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Title: Change timeline CTI file generation (state-count, fixed length = 64, default entries)

Description of Request:
The IOM MA_SCIA-0000DO/01 requires in §12.2 for timeline loading:
Usage of the SET TIMELINE MCMD ZI053-99 in flight
For practical reasons the following rules have been established:

- Timelines are loaded as a whole, i.e. one MCMD for one Timeline
- The MCMD ZI053-99 has a fixed length of 64 State entries. Up to 63 entries can be used for Measurement States and one must be used as State 255, which is the "End of Timeline" marker
- Timelines with less than 64 States will be loaded such, that n States will be allocated to the entries 1 through n, being followed by"0" entries from n+1 to 64. Note: per definition n includes the "End of Timeline" marker which is State 255
- ESOC will generate the MCMD ZI053-99 using the DLR inputs via the CTI-Interface for SVTs and in flight. The corresponding file which is used as input from SOST to ESOC is: CTI_Txx_SH, with xx = 1...63.

The 2nd bullet defines a fixed length of MCMD ZI053-99 of 64 entries, the 3rd bullet specifies, that 'unused' entries are filled by default with '0' .

The present version of the timeline CTI converter produces timeline CTI files with variable length, which is in conformance to the definition of the MCMD in IOM annex 6 here A6.57. Presently the parameter 'state count' used in MCMD ZI053-99 represents the number of entries 'n' in bullet 3 above. Since the transcription of the received CMD by the ICU to the onboard parameter store works such, that based on the parameter 'state-count' only entries 1 to 'n' are inserted, the length of the parameter block loaded into onboard tables is not '64' as required in bullet 2 above but 'n' and the filling entries with default value '0' are not entered. In consequence former entries in the onboard table are not overwritten by the new default value '0' at entries higher than 'n' but remain. Detailed analysis at ASTRIUM and SOST confirm above findings.

To establish conformance of the content of the transmitted timeline CTI file with the requirements of IOM §12.2 the CTI converter output shall be changed to produce above required onboard TL-table format (see also attached e-mails dated 4th February 2003 and 21st May 2004).

| Originator: E. Krieg DLR/IMF-AP | Date of Issue: 16 June 2004 | Signature: e-mail, E. Krieg 16 June 2004 |
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Assessment of SSAG (necessary for requests by scientists): ***not required*** *(SCIA-FOCC-i/f specific)*

| SSAG: | Date | Signature: |
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Classification of OCR: D

OCR Analysis (incl. Implementation Option):
This OCR requires modification of the generation of timeline CT files, i.e. the files shall 'force' the ICU to transmit the full fixed length parameter block of the CTI-file into the TL-onboard store (RAM). SOST-DLR has developed an update to the present TL-CTI-converter, which produces fixed length parameter blocks (n=64 with '0-fillers') and sets the state count permanently to length = 64.

Note:

- according to attached e-mails the compliance of this OCR to the onboard system is confirmed by ASTRIUM (see attached e-mails)
- since the change affects the SCIAMACHY-FOCC i/f it is required, that ESOC checks the findings and proposed implementation for compliance with CMD generation at ESOC

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| SOST: E. Krieg, DLR/IMF-AP | Date: 16/06/2004 | Signature: via e-mail 16/06/2004 |
| Approval of Proposed Implementation: | | |
| Originator Approval: | Date: | Signature: |
| Astrium Approval:<br>P. Lützow | Date:<br>2004-06-22 | Signature:<br>e-mail, P. Lützow, 2004-06-22 |
| ESOC Approval:<br>F.Diekmann, A.Moore<br>Minutes of telecon | Date:<br>2004-06-25 | Signature:<br>e-mail, A. Moore, 2004-06-25 |
| Decision / Approval:<br>The OCR shall implemented as proposed. | | |
| DLR Approval:<br>Ch. Chlebek | Date:<br>2004-07-28 | Signature:<br>e-mail, Ch. Chlebek, 2004-07-28 |
| Implementation by SOST:<br>For orbit 13291 (September 14th), 4 test timelines covering a complete orbit (ID 1, 47, 53, 63) are generated with the modified converter as proposed by OCR_018. The test timelines are transferred to FOCC, uploaded and executed (note that the scientific content does not differ from the corresponding timelines for routine operations). Provided that the test timelines run as expected it is proven that the converter modification can be regarded as operational and all timeline CTI files to be generated from this date on will be based on the modified converter. | | |
| SOST: M. Gottwald, DLR-IMF | Date: 28/07/2004 | Signature: via e-mail 28/07/2004 |

**Appendix : email exchange DLR - ASTRIUM and ESOC**

**a.**

Von: Krieg, Eckhart
Gesendet: Dienstag, 4. Februar 2003 15:47
An: 'Kroeger, Hans'; Gottwald, Manfred
Cc: Peter Luetzow-Wentzky; Toni Niessen
Betreff: AW: Timeline MCMD

Hi,

das ist soweit ich mich erinnere ganz richtig so. Der converter ist auch so gebaut, nur das FOCC hat wie wir aus dem dump im Dezember sahen, nicht den kompletten Inhalt des CTI-files geladen, sondern füllt das template ZI053-99 so, daß der parameter 'STATE COUNT' die Länge des Datenblocks des MCMD bestimmt und nicht wie von uns erwartet die CTI-header Information bzgl. der Länge des Datenblocks, die bei uns auf den festen Wert = 130 gesetzt ist(64+2 TL-entries + start-index + state-count).
Deshalb hatten wir hier beim Dump im Dezember noch die alten Werte der Vorläufer-TL's an den indices stehen, an denen in den neuen Versionen eigentlich die '0' mittels mcmd durch Überscheriben dieser Werte eingetragen werden sollte.
Ich bastle in den nächsten Tagen am Converter weiter, um da auf ein vernünftiges Konzept zu kommen.
Gruß

ekg

-----Ursprüngliche Nachricht-----
Von: Kroeger, Hans [mailto:Hans.Kroeger@astrium-space.com]
Gesendet: Dienstag, 4. Februar 2003 13:51
An: Krieg, Eckhart; Gottwald, Manfred
Cc: Peter Luetzow-Wentzky; Toni Niessen
Betreff: Timeline MCMD

Im IOM habe ich gefunden:

Usage of the SET TIMELINE MCMD ZI053-99 in flight
For practical reasons the following rules have been established:
* Timelines are loaded as a whole, i.e. one MCMD for one Timeline
* the MCMD ZI053-99 has a fixed length of 64 State entries. Up to 63 entries can be used for Measurement States and one must be used as State 255, which is the "End of Timeline" marker
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* ESOC will generate the MCMD ZI053-99 using the DLR inputs via the CTI-Interface for SVTs and in flight. The corresponding file which is used as input from SOST to ESOC is:
CTI_Txx_SH, with xx = 1...63

Frage: ist das gültig?

Gruss
--hk

**b.**

Von: Luetzow-Wentzky, Peter
[mailto:Peter.Luetzow.Wentzky@astrium.eads.net]
Gesendet: Freitag, 21. Mai 2004 20:00
An: Krieg, Eckhart
Cc: Gottwald, Manfred; Kroeger, Hans; Niessen, Toni
Betreff: RE: TL-CTI-format

Hallo Eckhart,

unser ICU-S/W-Experte hat mir Deine Annahme (letzter Satz der Mail) bestätigt.

Die MCMD-Länge wird nur bei MCMD_Reception benutzt, um zu prüfen, ob an der erwarteten Stelle der MCMD trailer gefunden wird.
Bei der weiteren Kommandoverarbeitung ist die Länge gar nicht mehr verfügbar.
Der Umfang der Übertragung aus dem Empfangspuffer in den TL store richtet sich ausschließlich nach dem State Count.

Ich habe auch prüfen lassen, ob eine Heraufsetzung des State Count auf 64 fix bei der gegebenen Länge des Set Timeline MCMD ZI053-99 zu Problemen führen könnte. Die Antwort ist NEIN.
Es gibt weder mit dem State Count Parameter selbst noch mit den zu übertragenden Füllwerten 0 für State ID und Timetag Probleme.
Ich würde daher raten, dies entsprechend zu ändern und damit den Inhalt der von Dir gelieferten CTI Files (Timeline mit auffüllenden Nullen) auch vollständig in die ICU zu laden.

Übrigens ist in dem in der Datenbank an ESOC abgelieferten MCMD ZI053-99 ein Default Wert von 64 für "State Count" bereits eingetragen.

Schöne Grüße und schönes Wochenende,
Peter.

-----Original Message-----
From: Krieg, Eckhart [mailto:Eckhart.Krieg@dlr.de]
Sent: Dienstag, 23. September 2003 15:24
To: 'Diekmann Frank-Jürgen (E-Mail)'; 'Andrew Moore (E-Mail)'
Cc: Gottwald, Manfred; Kroeger, Hans; Niessen, Toni; Luetzow-Wentzky, Peter;
Daniel Mesples (E-Mail)
Subject: TL-CTI-format

Hi Frank and Andy,

I talked now to Toni to discuss the results from last year's analysis of the final-flight dumps, when he and Daniel realised mismatches between 2 dumps of 2 subsequent loads of the nearly identical full ' Flight parameter configuration ' in particular within the tl-store. The subsequent analysis by myself showed, that we had remainders of former tl-loads, when the newer tl was shorter than the former one.
Today a coarse analysis of tl-CTI-files and executed mcmds showed, that the cmds were produced in all cases with a fixed full length parameter block resp. mcmd irrespectively of the actual length of the tl.

Toni confirmed my opinion, that the truncation of the mcmd parameter block is almost certainly done by the SCIA ICU.
This is based on the inspection of the CTI-file (length of the parameter block = 130) and the inspection of the uplinked mcmd via SPEVAL (mcmd-header with mcmd-length = 87hex) with both files containing the parameter

state-count with the actual number smaller than 64 and containing in all cases always a fixed number of entries = 64 as specified by the IOM using default values ' 0 ' as fillers for unused entries past the End of Timeline marker.

As we are not at all shure, what a change in the parameter definition for the parameter state-count could cause onboard, we have decided to leave the situation presently as is.
I will continue to produce in the CTI-file the actual state count thus the ICU will not overwrite any parameter past the End of Timeline marker with the default value ' 0 '. Insofar we will see mismatches in the tl-RAM-area with any comparison of dumps .
We consider this as a minor effect since any nominal tl-swapping between dumps would also cause a miscompare. An analysis of the tl-load history would be needed in such a case as well.

The pending transfer of the full Tl-set for improved limb/nadir-matching will be done using the proven converter output as up to now.

To Hans:
referring to mail 'timeline mcmd' dated 4 February 2003 I have to state:
the generation of the tl-CTI-file and its content as well as the transcription into the executable mcmd by FOCC are both in full compliance with IOM chapters 4 p.11 & 12 p. 8 and IOM A6 p.99. It seems, that SCIA-ICU uses not the mcmd length in the mcmd-header but state-count in the data block to define the block length of data to be written into the tl-store.

> Eckhart