

**MINUTES OF NAVIGATION WORKING GROUP SPRING 2022 WORKSHOP 05-Jun-2022**  
**David S. Berry / Chair**

The CCSDS Spring 2022 Navigation Working Group Meetings were conducted virtually via audio/videoconferencing on five Wednesdays between 27-Apr-2022 and 25-May-2022, with a MOIMS Closing Plenary on 30-May-2022. Nominally NASA hosted the meetings, which were to have been held at Huntsville, Alabama, USA, but the responsibilities of "hosting" were more or less undefined in the virtual meeting situation. This is a summary of the activities of the Navigation Working Group (WG) during the Meetings. The Navigation WG is an element of the Mission Operations and Information Management Services (MOIMS) Area in the CCSDS organization. All CCSDS Areas and Working Groups were empowered to set their own meeting schedules subject to a CESG ending deadline.

**ON-SITE PARTICIPANTS**

Not applicable.

**TELECON PARTICIPANTS**

David Berry (NASA/JPL), Julien Bernard (SANA), Michel Bernier (SANA), Vitali Braun (ESA/ESOC), Juan Crenshaw (NASA/GSFC), Frank Dreger (ESA/ESOC), Jean Gilbert (SANA), Cheryl Gramling (NASA/GSFC), Julie Halverson (NASA/GSFC), Hideaki Hinagawa (JAXA), Ralph Kahle (DLR/GSOC), Alain Lamy (CNES), Jose Miguel Lozano (GMV/ESA/ESOC), Dan Oltrogge (NASA (COMSPOC, SDC, ISO TC20/SC14)), Brian Swinburne (Airbus/UKSA), Patrick Zimmerman (NASA/JSC).

**AGENDA**

The final agenda for the WG meetings is available on the Navigation WG CWE at: <https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/navwg-agenda-spring-202205.pdf> .

<b>Date</b>	<b>Time</b>	<b>Topic(s)</b>	<b>Presenter(s)</b>
Wed 27-Apr-2022	1300-1500 UTC	<ul style="list-style-type: none"> <li>• Introductory Material</li> <li>• Conjunction Data Messages P1.0.2 review comments</li> </ul>	<ul style="list-style-type: none"> <li>• David</li> <li>• Brian &amp; Dan</li> </ul>
Wed 04-May-2022	1300-1500 UTC	Navigation Data Messages Schema Naming/Versioning Issues	David & Jose Miguel
Wed 11-May-2022	1300-1400 UTC	Tracking Data Messages proposed augmentations and changes	Cheryl & Juan
Wed 11-May-2022	1400-1600 UTC	CCSDS Spring Meeting Opening Plenary	Secretariat, CESG Chair, Area Directors
Wed 18-May-2022	1300-1500 UTC	Attitude Data Messages prototype test philosophy and planning	Alain & Julie
Wed 25-May-2022	1300-1400 UTC 1400-1500 UTC	<ul style="list-style-type: none"> <li>• SANA Registries Discussion</li> <li>• Closing Report</li> </ul>	<ul style="list-style-type: none"> <li>• SANA Team</li> <li>• David</li> </ul>
Mon 30-May-2022	1400-1600 UTC	MOIMS Closing Plenary	MOIMS AD, WG Chairs and Deputies

## CURRENT ACTION ITEMS

The following action items were produced during the meetings, or carried forward from previous meetings if they had not yet been completed. They are also available on the CWE at <https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/navwg-action-items-202205.pdf>. The action items and due dates below reflect the status as of the end of the meetings; the list on the CWE will be updated periodically between the end of this meeting series and the beginning of the next meeting series. The list on the CWE will thus reflect relative completion progress and any new action items added after the meeting series.

If "Status" = "Open", then "Date" = "Target Date"

If "Status" = "Complete", then "Date" = "Completion Date"

If "Status" = "Cancelled", then "Date" = "Cancellation Date"

Sort by "Status" (Descending), "Date" (Ascending)

##	Action Item	Actionee	Status	Due Date (Original)	Date
28	Add new entries to "Conjunction Data Message CATALOG_NAME" SANA Registry	David	Open	08-Sep-2021	15-Jun-2022
47	Send list of operator catalogs to David	Dan	Open	11-Mar-2022	15-Jun-2022
46	Technical review of CDM P1.0.2	All, as assigned	Open	11-Apr-2022	15-Jun-2022
51	Finalize ODM prototypes and Test Plan; commence testing	Dan	Open	27-Apr-2022	29-Jun-2022
53	Determine organization for Italian RDM Provider role	Elena	Open	26-Feb-2020	29-Jun-2022
55	Review NDM/XML schema naming and versioning topics, provide comments	All	Open	29-Jun-2022	29-Jun-2022
57	Correct schema set download feature on SANA Registry	David	Open	29-Jun-2022	29-Jun-2022
63	Add MS Word versions of prototype test plans/reports (as available) to CWE	David	Open	29-Jun-2022	29-Jun-2022
64	Provide info on SANA REST API to WG	David and Jose Miguel	Open	29-Jun-2022	29-Jun-2022
65	Update ADM V.2 Test Plan draft	Alain/Julie	Open	29-Jun-2022	29-Jun-2022
98	Produce Navigation Events Message initial draft	Alain	Open	31-Jan-2018	29-Jun-2022
36	Send CDM draft to Tom Gannett for pre-Document Processing review and comment	David	Open	10-Jan-2022	30-Jun-2022
62	Determine improved NDM/XML schema versioning system	Jose Miguel and David	Open	29-Jun-2022	15-Jul-2022
58	Produce TDM P2.0.1 update	Juan / Cheryl	Open	15-Aug-2022	15-Aug-2022

##	Action Item	Actionee	Status	Due Date (Original)	Date
59	Distribute "Divide & Conquer" review assignments for TDM P2.0.1 draft	David	Open	17-Aug-2022	17-Aug-2022
74	Prepare Navigation references for SANA Registry	David	Open	31-Oct-2018	30-Aug-2022
92	Submit Revised Orbit Centers Registry data for SANA Registry	David	Open	17-Dec-2018	30-Aug-2022
94	Library of referenced papers on CWE	David	Open	10-May-2021	30-Aug-2022
10	Create Nav WG standard Blue Book template with Nav WG approved Annex ordering	David	Open	28-Jul-2021	31-Aug-2022
17	Update Navigation Terms in CCSDS Glossary (original + RDM terms)	Secretariat	Open	31-Aug-2019	31-Aug-2022
19	Produce TDM P2.0.1	Cheryl	Open	11-Oct-2021	31-Aug-2022
60	Review TDM P2.0.1 draft	All, as assigned	Open	30-Sep-2022	30-Sep-2022
96	SANA implementation of Nav References	SANA	Open	31-Jan-2019	30-Sep-2022
79	Modify/clarify floating point number rules	Dan	Open	09-Dec-2020	17-Oct-2022
39	Attend CCSDS Editor's Boot Camp for refresher	All	Open	13-May-2022	21-Oct-2022
61	Produce TDM P2.0.2 update	Juan / Cheryl	Open	18-Nov-2022	18-Nov-2022
44	Create ADM V.2 Test Plan draft	Alain/Julie	Complete	06-Apr-2022	18-May-2022
56	List of questions for SANA Operator	All	Complete	24-May-2022	24-May-2022
52	Discuss/determine better NDM/XML schema versioning with SANA	David	Complete	27-Apr-2022	25-May-2022
49	Send ODM Test Plan MS Word version to Alain/Julie	Dan	Cancelled	18-Mar-2022	25-May-2022

## **WORKSHOP PROCEEDINGS**

### **WEDNESDAY 11-May-2022**

#### **CCSDS Opening Plenary / Schedule Details**

As in the recent virtual meeting series, a CCSDS-wide Virtual Opening Plenary was conducted. Schedule-wise, the CCSDS Opening Plenary occurred 2 days into the nominal first meeting week, but due to the Navigation WG Meeting schedule, it occurred immediately following our third weekly WG meeting. However, for "logical purposes", it is presented in these minutes as if it had occurred as the first meeting of the Spring Meetings, conforming to the traditional schedule.

Attendance at the Opening Plenary included: David Berry, Frank Dreger, Juan Crenshaw, Cheryl Gramling, Brian Swinburne, Patrick Zimmerman. The Opening Plenary covered a number of topics. Here are a few keynotes:

- Klaus Juergen-Schulz, CESG Chair, opened the meeting with a number of statistics on CCSDS documents published since the Fall 2021 Meetings and the distribution of leadership across the CCSDS Member Agencies. He stated that there had been no changes in the membership of the CMC/CESG since Fall 2021, but noted that Colin Haddow, Deputy Area Director for Cross Support Services, is in the process of retiring.
- After some general information was presented, the Area Directors each discussed the character and plans for their associated working groups. Mario characterized the Nav WG as "a very active group" having "a solid work plan".
- The informational presentation provided by the Secretariat is available on the Navigation WG CWE at [https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/S22-Opening-Plenary\\_Final.pdf](https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/S22-Opening-Plenary_Final.pdf) ). The presentation included information about the following future meeting series:
  - a) Fall 2022 hosted by CNES at Toulouse, France, 17-Oct-2022 through 21-Oct-2022, Mercure Hotel
  - b) Spring 2023 hosted by NASA at Huntsville, Alabama, USA, dates TBD
  - c) Fall 2023 hosted by ESA at ESTEC (Noordwijk?), dates TBD
  - d) Spring 2024 hosted by NASA at TBD, dates TBD
  - e) Fall 2024 hosted by UKSA at TBD, dates TBD
  - f) Spring 2025 hosted by NASA at TBD, dates TBD

### **MOIMS Opening Plenary**

There was no separate MOIMS Opening Plenary.

### **WEDNESDAY 27-Apr-2022**

Attendance this day included: David Berry, Vitali Braun, Cheryl Gramling, Julie Halverson, Hideaki Hinagawa, Ralph Kahle, Alain Lamy, Jose Miguel Lozano, Don Oltrogge, Brian Swinburne, Patrick Zimmerman.

### **Spring 2022 Meeting Introductory Matters**

David welcomed the group and presented an abbreviated version of the "Introduction to Navigation WG" material focusing on progress since Fall 2021 and goals for the Spring 2022 Meetings. He took an action item to send out the introductory presentation after the meeting; it is also available on the CWE at: <https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/navwg-intro-202205.pdf> .

### **Conjunction Data Message Discussion**

The main topic of this meeting was review of comments received to date for the CDM P1.0.2 draft. Brian reported that he had received 72 comments to date, of which 50 were editorial and he has already modified the draft to reflect them.

The bulk of the meeting was spent in discussion of the remaining 22 comments. We discussed the fact that comments on the XML material are on hold for the time being; there are a number of issues with the

naming and versioning of the schemas that David and Jose Miguel are working to resolve. These topics will be the focus of the 04-May meeting.

Some of the topics that were discussed and resolved included addition of keyword(s) related to the amount of lead time that would be required prior to the TCA in order to design, approve, and implement any risk remediation maneuver. The name of the keyword is yet to be finalized; Brian and Dan will discuss and resolve the keyword(s) name.

One of the CDM comments pointed out that there were references to both OEB\_INT and OEB\_MED in Annex F, page F-5, where there is a duplicated section of text that refers to OEB\_MED. Note that this same duplicated text and obsolete reference also appears in the most recent version of the ODM, the one that contains RID resolutions (page F-1). David will convey this to Dan, since he had left the meeting by this time due to another commitment.

As was the WG experience during the original development of the CDM, the topic of reference frames was again raised; this time with respect to the way we want to handle the existence of the SANA Registries that list a relatively large number of possible frame relative to the number that are defined in the CDM version 1. While there is some interest in not restricting the number of reference frames, David expressed the opinion that opening wide the number frames in which CDM information can be reported would not be consistent with the discussions that occurred during the CDM initial development.

The internal review period of the CDM P1.0.2 is ongoing.

### **WEDNESDAY 04-May-2022**

Attendance this day included: David Berry, Vitali Braun, Frank Dreger, Cheryl Gramling, Hideaki Hinagawa, Ralph Kahle, Alain Lamy, Jose Miguel Lozano, Brian Swinburne, Patrick Zimmerman.

### **Navigation Data Messages XML Specification Status**

The main topic of this meeting was a presentation of various issues related to XML schema naming and versioning. David presented an overview of the issues, and also some ways in which he and Jose Miguel have discussed addressing them. An action item was assigned to the WG members to review the presentation material and provide feedback on the issues and proposed resolutions.

One issue that presented itself was the fact that a number of registries were added to the SANA "beta2" registry in order to be available for the Orbit Data Messages Agency Review, and David intended to show this to the attendees, however, there is some type of programming error in the page. Subsequent to the meeting, David reported the error to the SANA Operator, who informed us that the error was known by the SANA Team; it had resulted from some changes made by their cloud provider and they are working on fixing the issue and rebuilding the beta pipeline. The issue should be resolved soon (but no target date could be provided yet).

We discussed the time frame for making the various recommended changes to schema names and versions, and determined that a solution must be in place in the next four months. Four months is the estimated time for completing the ODM prototypes, running and analyzing the tests specified in the Test Plan, Secretariat Document Processing of the ODM prior to publication, and the requisite CESG/CMC "Approval to Publish" polling.

One good suggestion that was raised during the discussion of the material was to include the "beta" in the URLs of documents under review. This will enable the links to work during document reviews by the CESC, CMC, and also by reviewers performing Agency Review. Then, prior to final publication, the Secretariat can remove the "beta" prefix. This will address some of the problems that have been encountered, but not all. Jose Miguel has also suggested using notes at the beginning of the schema registry, similar to those found at the beginning of the "Functional Resources" registry, that provide explanation about the schemas, which versions are available on the SANA, which versions are available on the CWE, how to download the entire schema set, etc.

The material presented during this session is available on the CWE at <https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/presentation-ndmxml-issues-202205.pdf>.

### **WEDNESDAY 11-May-2022**

Attendance this day included: David Berry, Vitali Braun, Juan Crenshaw, Frank Dreger, Cheryl Gramling, Hideaki Hinagawa, Ralph Kahle, Jose Miguel Lozano, Dan Oltrogge, Brian Swinburne, Patrick Zimmerman.

### **Introductory Material**

David started the meeting by noting that this meeting would be only one hour in duration in order to allow anyone who wishes to attend the CCSDS Spring Meetings 2022 Opening Plenary meeting to do so. He also requested attendees to submit to him by 24-May-2022 any questions they might have for the SANA Operator Team, which will be joining us for our final Nav WG Spring Meeting on 25-May-2022.

### **Tracking Data Message V.3**

The topic for this meeting, led by Cheryl, was to provide a status on the information content collected for inclusion in the Tracking Data Message (TDM) update. At the beginning of the presentation, Cheryl introduced Juan Crenshaw, who will be joining the Navigation WG in the role of Lead Editor for the TDM update, with Cheryl transitioning to co-editor. Juan has extensive experience with tracking data and the NASA tracking networks: the Deep Space Network and the Near Space Network (previously known as the Near Earth Network and Space Network).

Changes proposed for the TDM V.3 include:

- Amended and new metadata
- Many new measurement data types
- Better accommodation of relay networks
- Better assignment of data attributes
- Onboard data types
- Classification of data (e.g., classified, unclassified, top secret, secret, etc.)
- Extensions to DATA\_QUALITY, along with re-locating this information from the Metadata Section to the Data Section and documenting it for each measurement
- Accommodating a larger number of PARTICIPANTs in a TDM segment

For future plans, Juan and Cheryl proposed the following schedule items:

- August 2022 Delivery: Update TDM B-2 to vP2.0.1 inline with new metadata and data keywords, descriptive text, examples, units, M/O/C.

- November 2022: Updated version (P2.0.2) with comments integrated from Nav WG review of P2.0.1
- Cheryl also suggested that a discussion on modularizing the TDM for V.3 be conducted, but this will be scheduled at a future time. (For example, during discussion some overlaps with other standards were noted, but these could presumably be addressed during the modularization process.)

After the presentation David suggested that the new content be prioritized given that the amount of material is large and will likely constitute a several years of work. There are also several backward compatibility issues to consider.

The material presented during this session is available on the CWE at <https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/presentation-tdmV3-topics-202205.pdf>.

### **WEDNESDAY 18-May-2022**

Attendance this day included: David Berry, Vitali Braun, Frank Dreger, Cheryl Gramling, Julie Halverson, Hideaki Hinagawa, Ralph Kahle, Alain Lamy, Jose Miguel Lozano, Dan Oltrogge, Brian Swinburne, Patrick Zimmerman.

#### **Introductory Material**

- David started the meeting by pointing out that the CWE schedule for the ODM is showing "Behind Schedule"; we will fix this by recording a completion date for the Orekit prototype. Dan added that the second prototype is still in preparation probably for another month or two. Dan also inquired about the status of a SANA change to add the number of elements to some of the SANA Registries; David responded that the change had been made in the beta2 set of registries, and the beta2 is currently broken due to some changes that were introduced by the SANA Operator's cloud provider.
- David reminded the group to submit by 24-May-2022 any questions they might have for the SANA Operator Team, which will be joining us for our final Nav WG Spring Meeting on 25-May-2022.
- As a lead-in to the ADM discussion (the topic of the day), David announced that the ADM had passed the CESG Poll required to enter the Agency Review; as of the meeting the companion CMC Poll had not yet started.

#### **Attitude Data Messages Prototype Testing Plans**

The principal topic of this day's discussions was ADM V.2 prototype testing. Alain presented a draft of material on the ADM test philosophy and plan. Alain noted that he had reviewed the testing strategy for the ADM V.1 to get ideas of what testing should look like for the ADM V.2. The document describes the tests that are planned. Alain asked who would participate in the testing, and cited the fact that having more testers implies less work for each tester. However, specific participants and assignments to tests have not yet been requested.

Alain then asked a few questions about the test plan, e.g., "Are the planned tests sufficient?". He showed a set of arguments intended to prove that a specific prototype was or was not necessary. This approach to the test plan for the ADM relies heavily on analysis and "homomorphism", i.e., the APM and AEM functions that can be described in ADM V.1 can also be described in ADM V.2, but perhaps with different keywords and/or options. In such cases, it is posited that a prototype is not necessary. As is stated in the plan, "The APM (and AEM) version 1 have already been proved to be useable in an operational context. So the APM (and AEM) version 2 are also useable in an operational context if the

data present in the message are the same, or if it can be shown that the data in a version 1 message can be converted into data in a version 2 message." We had discussion of the validity of this type of analysis as a prototyping approach. As an additional measure of showing the useability of the V.2 messages, Vitali suggested using the old test data, however, David stated that it is doubtful that this test data and the test apparatus are preserved anywhere. Such practices were not well considered at the time the original ADM was prepared in 2008.

The homomorphism approach will not be sufficient for the ACM testing since it is a completely new message with many features that are not present in the ADM V.1. The draft ADM V.2 test plan for the ACM is modeled after that of the OCM in the upcoming ODM V.3.

David asked that Alain send him the material that was presented. It is available on the Nav WG CWE at [https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Draft%20Documents/Attitude%20Data%20Messages%20\(ADM\)/ADM\\_Test\\_Plan\\_Report\\_Draft.pdf](https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Draft%20Documents/Attitude%20Data%20Messages%20(ADM)/ADM_Test_Plan_Report_Draft.pdf).

### **WEDNESDAY 25-May-2022**

Attendance this day included: David Berry, Julien Bernard, Michel Bernier, Vitali Braun, Frank Dreger, Jean Gilbert, Alain Lamy, Jose Miguel Lozano, Dan Oltrogge.

### **SANA Registries Discussion**

The first hour of the meeting was allocated for discussion of various SANA questions raised by the Team and general discussion about SANA Registries. Here are a few questions prepared by the CCSDS Navigation Working Group in preparation for the meeting:

1. Recent attempts to access <https://beta.sanaregistry.org> and <https://beta2.sanaregistry.org> have consistently timed out. Per Julien, these have been due to changes in the cloud API and other changes in the SANA infrastructure. One issue they have been addressing is when changes in the beta persist for a long time before being ready for Production (e.g., some of the ODM related registries in beta2 have been there for a while, but cannot yet be moved to Production; this delays other changes in the beta2 that may be ready for Production). The concept of "infinite betas" was brought up without a great deal of explanation, but conceptually it sounds as though changes in the beta environment may be isolated in their own beta so they can move to Production independently of other registries in beta. Julien indicated that he would let us know when these are ready.

2. What documentation is available for the SANA REST interface (e.g., features, limitations, security requirements, user guide)? Julien stated that WG members could request SANA accounts, and would then be able to see the API and the available documentation. Jose Miguel Lozano has already applied for an account and David will too.

3. What is the current status of authorizing WG representatives to edit certain pages in the SANA Glossary? Privileges for editing pages in the Glossary will continue to be reserved for the Secretariat. Because the Glossary is shared across all the CCSDS Working Groups, and there is also now a "terminology harmonization" effort in progress with ISO TC20/SC14, the privileges for editing need to be more sparingly allocated. Other registries for which the update policy is "CCSDS Area or Working Group" will be able to make their own edits.



4. What is the current status of authorizing WG representatives to edit entries in Working Group Level Registries? See response to question number 3. Many of the Nav WG registries have the Policy of "Expert Review", which is more complicated according to Julien (e.g., how to certify that someone is an appropriate "expert").

5. We'd also like to discuss some XML schema naming and versioning issues and some proposed solutions with the team. In large part, this discussion was the same material that was presented to the Working Group in the 04-May-2022 meeting. As noted previously, the 04-May material is available at <https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/presentation-ndmxml-issues-202205.pdf> . To illustrate some of the ideas, David also showed two different mockups of potential implementations:

- <https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/ndmxml-archive-mockup1.html>
- <https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/ndmxml-archive-mockup2.png> .

Of these two mockups, Julien indicated that the mockup1 was preferable. No decisions with respect to this topic were made during this meeting as we were near the top of the hour and the group needed to work on the final report. David committed to sending the presentation and mockups to the SANA Team.

### **Final Report Preparation**

David reviewed the draft Final Report with the WG members, and we worked through it making modifications as applicable. There were three document completion dates that needed to be updated, but their Lead Editors were not present at the meeting; David made plans to query them via email for any necessary updates. The report will be presented at the MOIMS Final Plenary Meeting on 30-May-2022 (see below for the report contents).

The dates for monthly telecons are listed at the end of these minutes. Meeting announcements will be sent in advance of each meeting. The single 1-hour meeting per month will be maintained, focused on one primary topic with administrative material kept to a minimum.

All materials from these Spring meetings (action items, agenda, introductory presentation, report, document presentations, and these minutes) are available on the CWE at the following link:

<https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/>

Draft documents reviewed during the meetings are in their respective directories on the CCSDS CWE: <https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Draft%20Documents/> (sort by "Name" for easier searching).

### **Orbit Data Messages Briefing & UNCOPUOS Space Traffic Control**

After working on the Final Report, we had a few more minutes left in the meeting and Dan gave a brief update on the ODM testing status. He reported that the Orekit team has updated their readers to accommodate the changes made in Agency Review RID dispositioning. There are 11 different tests. The same test cases are being worked on the COMSPOC side. Dan anticipates that read/write tests will be complete by mid-July.

Dan also showed a draft UNCOPUOS document on the topic of Space Traffic Control (STC), and the prominent presence of ISO/TC20/SC14 standards and CCSDS Navigation Data Messages in the framework. STC in the Earth orbital environment is an area of growing interest (and necessity).

## **MONDAY 30-May-2022**

Attendance this day included: Mario Merri (MOIMS Area Director), Marc Duhaze (MOIMS Deputy Area Director, MP&S Deputy Chair), David Berry (Nav Chair), Frank Dreger (Nav Deputy Chair), David Giaretta (DAI Chair), John Garrett (DAI Deputy Chair), Mehran Sarkarati (SM&C Chair), Peter van der Plas (MP&S Chair).

### **1400 1600 MOIMS Closing Plenary**

Mario expressed hope that Spring 2022 is the last virtual meeting, since travel seems to be picking up a bit (in fact, Mario mentioned that he would be flying to the United States the following day for meetings at NASA/Ames and JPL). That the meetings are much more productive when we are offsite, face-to-face, was once again expressed by every MOIMS Working Group.

After Mario's introductory remarks, the Working Group Chairs delivered their reports: Mehran Sarkarati for Spacecraft Monitor & Control (SM&C), David Giaretta for Digital Archive Ingest (DAI... note that DAI meets every week, not just during CCSDS Meeting series!), Peter van der Plas for Mission Planning and Scheduling (MP&S), and David Berry for Navigation (Nav). The Navigation report immediately below was presented during the Plenary. The report is also available on the CWE at <https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/navwg-report-202205.pdf> . The MOIMS Area Director report to the CESG (which combines the reports prepared by all of the Working Groups) is available on the CWE at <https://cwe.ccsds.org/moims/docs/MOIMS-NAV/Meeting%20Materials/2022/Spring/S22-MOIMS-Report-to-CESG-v2.pdf> .

## **NAVIGATION WORKING GROUP CLOSING REPORT for "VIRTUAL HUNTSVILLE #3"**

### **NAV WG Executive Summary**

#### **Achievements for this Meeting Cycle**

- Initiated discussion of Attitude Data Messages Pink Book prototyping and test planning. Completed review of results of CESG Poll for Agency Review.
- Initiated discussion of Conjunction Data Message V.2 Pink Book comments from internal review of Pink Book P1.0.2
- Initiated more formal discussion of planned content upgrades for the Tracking Data Message V.3. Introduced new lead editor to the group.
- Continued discussion of NDM/XML V.3 and issues of schema naming and versioning that have caused issues in nearly every CCSDS community.
- Continued discussion of Orbit Data Messages V.3 prototype testing status

#### **Working Group Status**

- A total of 5 meetings, Wednesdays starting 27-Apr-2022, ending 25-May-2022
- Active, "High Momentum" (some momentum loss with virtual format of last few semi-annual meetings)

#### **Interaction with Other WGs**

- Met with SANA Operator Team to discuss various SANA Registry topics.

#### **Problems and Issues**

- Virtual meetings have allowed us to continue making some progress, but scheduling virtual meetings presents several issues... it will be good to get back to a full week of meetings in Fall 2022!

#### **Resolutions Agreed Upon this Meeting:**

- None

**Further Resolutions Anticipated in the Next 6 Months:**

- Possible resolution to advance the ODM V3.0 to Blue Book, if prototyping completes before the Fall Meetings.

**Planning (Only Approved Projects):**

WG	CCSDS Ref Nr	Document Title	Status / Comments	Start and / or Target Publication Date
MOIMS NAV	500.2	Navigation Data Messages Overview	New project approved 10/07/2021 (CMC-P-2021-09-007). Not yet started	Start date 01-Jun-2022 End date 28-Feb-2023
MOIMS NAV	502.0	Orbit Data Message (ODM) 5 Year Review Revision	Good progress. Document has completed Agency Review, ending 14-Dec-2021. RIDs dispositioned. One prototype is "complete" (pending any changes from Agency Review), second in progress.	Start date 16-Apr-2015 End date 31-Aug-2022
MOIMS NAV	503.0	Tracking Data Message (TDM) Version 3 Revision	Good progress. Discussed high-level development plan and a variety of expanded information in several categories.	Start date 06-May-2019 End date 30-Nov-2024
MOIMS NAV	504.0	Attitude Data Message (ADM) 5 Year Revision	Good progress. Completed CESG Poll prior to the Agency Review. Initiated prototype testing plans.	Start date 16-Apr-2015 End date 30-Apr-2023
MOIMS NAV	505.0	Navigation Data Messages XML Specification Version 3 Revision	Acceptable progress. Discussed a number of proposed schema name and versioning changes to address problems in multiple CCSDS cohorts.	Start date 25-Oct-2021 End date 31-Aug-2022
MOIMS NAV	507.0	Navigation Events Message (NEM)	Not discussed in these virtual meetings due to having lower priority than the ADM which has the same Lead Editor.	Start date 07-Nov-2017 End date 30-Nov-2024
MOIMS NAV	508.0	Conjunction Data Message 5 Year Revision	Good progress. Initiated resolution of issues raised during internal review of Pink Book P1.0.2.	Start date 14-Jan-2019 End date 31-Dec-2023

**NAV WG Issues for CESG / CMC**

- The CESG and/or Secretariat should consider designing templates for prototype test plans and prototype test reports.

**Participation**

- 5 sessions (1 per week starting 27-Apr-2022), plus Opening Plenary

Agency/Org	Number	Notes
ASI	0	
CNES	1	Alain Lamy
DLR	1	Ralph Kahle
ESA	3	Frank Dreger, Vitali Braun, Jose Miguel Lozano
JAXA	1	Hideaki Hinagawa
NASA	6	David Berry, Juan Crenshaw, Cheryl Gramling, Julie Halverson, Dan Oltrogge, Patrick Zimmerman
SANA	3	Julien Bernard, Jean Gilbert, Michel Bernier
UKSA	1	Brian Swinburne
Total	16	

## **NEXT TELECONS:**

We will continue inter-meeting telecons, but will revert to a 1-hour telecon monthly. If we are not making sufficient progress and the WG approves, we could go back to the 2-hour/meeting schedule.

- 29-Jun-2022 13:00-14:00 UTC
- 27-Jul-2022 13:00-14:00 UTC
- August 2022 NO MEETING
- 07-Sep-2022 13:00-14:00 UTC
- 05-Oct-2022 13:00-14:00 UTC
- 17-Oct-2022 through 21-Oct-2022 Fall Meetings at Toulouse, France

## NOTE:

Europe Daylight Savings Time ends 30-Oct-2022

US Daylight Savings Time ends 06-Nov-2022