CGMS-53-WGI-WP-06
11 March 2025

Prepared by: EUMETSAT
Agenda Item 5.1
Discussed at WG-I

Subject	**Report from the CGMS WGI Task Group on Data Collection Services (incl. latest ToR, status on current & proposed/planned activities)**
In response to CGMS action/recommendation	
HLPP reference	
Executive Summary	The primary task of the group has been to address the need for and make proposals for a new IDCS DCP standard, the development of DCS best practices for DCS data access and for DCP certification, as well as the inclusion of CGMS DCS webpage. The Task Group on DCS, consisting of DCS Managers from each of the satellite operators, have met virtually as part of the WGI Intersessional meetings, but also face-to-face in the context of other already scheduled DCS-related meetings. This paper presents the status of the Task Group on DCS activities and progress since CGMS-52. The discussions of the Enhanced DCP (E-DCP) standard have continued and is a major topic for the group. The group has developed a proposal for the way forward in developing a new IDCS/E-DCP standard but need some guidance.
Action/Recommendation proposed	WGI is invited to take note and comment on: - The status of DCS Task Group on DCS activities and progress since CGMS-52. - Endorse the proposal to further investigate the Ionospheric Scintillation and its potential use with DCS transmissions.

1 INTRODUCTION

This paper presents the report from the WGI Task Group on Data Collection Services (DCS). The creation of the group was endorsed at CGMS-46. This report covers the group's activities since CGMS-51.

The main purpose of the group is to make continued effective progress with DCS activities and issues in the context of CGMS. The first task of the group has been to address the need for and make proposals for a new IDCS DCP standard, the development of DCS best practices for common DCS data access mechanisms and DCP certification, as well as the inclusion of CGMS DCS webpage.

The Task Group on DCS, consisting of DCS Managers from each of the satellite operators, have met regularly as part of the virtual WGI Intersessional meetings, but also face-to-face in the context of other already scheduled DCS-related meetings.

2 TASK GROUP STRUCTURE AND MANAGEMENT ARRANGEMENTS

2.1 Core Members

As part of WGI, all CGMS members are encouraged to participate in the Task Group on DCS. The core members of this group are the DCS Managers from each of the following agencies:

EUMETSAT	Nicholas Coyne – Co-ordinator
EUMETSAT	Luis Soliveres Higuera
NOAA	William Dronen
NOAA	Letecia Reeves
JMA	Akihiro Shimizu

Also the following frequency managers:

NOAA	Beau Backus
EUMETSAT	Markus Dreis

A mailing list server for the WGI Task Group on DCS has been setup- WGI_DCS@LISTSERV.EUMETSAT.INT

The following people are included on the list in addition to those listed above:

- Anne Taube - EUMETSAT
- Dave Kunkee - Aerospace Corp
- Juha-Pekka Luntama – ESA
- Mark W. Turner – NOAA
- Melanie Heil - ESA
- Nancy Ritchey - NOAA
- Olga Ryzhkova - Roshydromet
- Sean Burns – EUMETSAT
- Thomas Feroli - NOAA
- Yu Deng – NOAA
- Hassan Haddouch – WMO

The co-ordinator should be informed of any CGMS members wishing to be included on the list.

2.2 Meetings

Intersessional Meetings

The group has held regular intersessional meetings since the last CGMS report. For the Enhanced DCP there was a face to face meeting in Washington in October 2024.

The intersessional meetings continued after CGMS-52 with a monthly frequency due to the discussions on the Enhanced DCP standard. There was a summer and winter pause.

2.3 Reporting

This Task Group on DCS provides a report (this report) of its Intersessional Meetings to WGI interested parties and a full report of its activities for review to CGMS WGI.

3 ACTIVITIES

3.1 New DCP Standards and Applications (A49.03)

The group had moved further with the subject of new standards and have identified a standard which is presented in a separate paper for endorsement CGMS-52-WGI-WP-14.

4 TERMS OF REFERENCE

4.1 Responsibilities

- To identify the needs for new International capable DCP standards taking into account the outcome of the ARTES 5.2 study commissioned by ESA
- To propose to CGMS the new international standard
- To facilitate the development towards on operational international standard
- Develop and maintain a DCS handbook
- The development of DCS best practices
- Develop and maintain the content for a CGMS DCS webpage
- Organisation of regular DCS workshops in co-ordination with the Satcom Forum
- Co-ordination of International DCS between the organisations
- Maintain an RFI DCS register
- Suggest improvements to the DCS especially based on the output of the SWOT analysis

4.2 Interactions

The Task Group will meet as part of the WG I Intersessional meetings with a goal of somewhere between 6 and 12 meetings per year. The majority of these meetings will be virtual but also some face-to-face meetings could be realised in the context of other already scheduled DCS-related meetings or meeting where a majority of the members would be present.

In addition to the regular intersessional meetings the Task Group will plan to convene a DCS workshop every 2 years. This will be arranged in co-ordination with the Satcom Forum, which is traditionally hosted during the Met Tech Expo. The goal of this workshop is to facilitate interactions between the operators, users and manufacturers.

5 FACE TO FACE MEETINGS

There where also two face to face meetings. The DCS workshop did not take place.

Meeting#1

CGMS Task Group and manufacturers 25 October 2024 Hunts Valley Microcom

Nick Coyne (EUMETSAT)

Brett Betsill (Microcom)

Skip Dronen (NOAA)

Chris Buchner (OTT)

Daniel Gillies (NOAA)

Beau Backus (NOAA-NASA)

James Logan (AEM)

Justin Dennison (NOAA-NASA)

Meeting#2

At OTT 1 November 2024

Nick Coyne (EUMETSAT)

Chris Buchner, OTT

Siva Telasula, OTT

Skip Dronen, NOAA

Daniel Gillies, NOAA

During these meetings we talked about the EDCP and the plans to develop and progress to a point where this could be used operationally. We arrived at the idea to have a 4 phased approach. We can work on the items in phase 4 independently of the other phases.

Phase A
The new modulation standards BPSK at 400 baud and QPSK at 800 baud would be introduced along with the forward error correction elements. It would not include any modifications to the DCP header to introduce some of the items that had been discussed previously, these would be in done in phase D.

Phase B
Certification of EDCP as defined in phase A.

Phase C
Operations of new standard.

Phase D
Addition of new headers to EDCP standard and other enhancement which will require new processing updates and also modifications on the user side.

6 ENHANCED DCP STANDARD

The Task Group has identified and proposed an initial EDCP Standard. Unfortunately, there is not a method or process to collectively resource a comprehensive plan for this project through CGMS. Absent this mechanism, but seeing great value in an EDCP standard, EUMETSAT and NOAA have proceeded with the development of general plan that relies on individual efforts at each agency. JMA has stated that there is no incentive or reason to extend its functionality and fund the new EDCP standard (Ref "Report of the 52nd Plenary Session of the Coordination Group for Meteorological Satellites" Section 7.3) This precludes the EDCP standard from being used as global international standard. The benefits of the EDCP for DCP robustness and moving platform suitability mean that even without the international aspect this is still of great benefit to the users.

To date, NOAA has incorporated the EDCP standard into ongoing communication protocol efforts. This is significant because it highlights the value of the CGMS Task Group's collaboration in that even without resources, sharing information can assist in standardizing activities that may benefit other groups. In a free and open exchange of information with all DCP manufacturers and DCP operators, NOAA has been able to incorporate feedback into current efforts for developing and testing the EDCP standard. Microcom has updated software for GOES DCS-based ground infrastructure and demonstrated a prototype of the 400-bps EDCP standard during the face-to-face meeting on 25th November 2025. They are now developing the 800-bps capability with plans to port this software to an existing DCP and conduct testing through April 2025. This is very promising. The prototype is being developed from the standard that was endorsed last year. It can already be seen that it may be necessary to relax the standard and target 350 and 700 baud to ensure the standard fits into a 1.5 kHz bandwidth. EUMESAT is now investigating how they may incorporate similar updates to their system for the same purpose. This ongoing effort will be subject to the

associated risk of relying on individual agency resources but the Task Group remains optimistic that the DCP Standard represents a transformational capability to improve and expand the capabilities of DCS operations within the timeline established by the group.

See EUM/CGMS/STD/23/1380795 “Enhanced Data Collection Platform Transmitter Standard”

https://www.cgms-info.org/Agendas/GetWpFile.ashx?wid=4969c01c-ff1c-4311-9cbb-9f6f1953ad96&aid=07602a85-29d2-48d1-b0d0-051d1d809273

The current revised schedule for the EDCP looks as follows:

2025

- Confirm the project funding plan – addressed with this document
- Produce and test a prototype transmitter
- Modify one of the receive sites to enable the reception of the EDCP
    - Microcom receivers are compliant. EUMETSAT TBC
- Test the system and verify the performance of the prototype and ensure it covers the different modes

2026

- Certify the EDCP transmitters from the manufacturers
- Modify the reception systems of all agencies
- Test the reception for all agencies and satellites

2027

- Declare EDCP operational

7 SWOT

In the SWOT analysis we identified the following 5 topics and the current status is indicated.

1. RFI Mitigation
   See section 10
2. Joint DCS PR Materials
   The group published the DCS Handbook. This will be republished to reflect the EDCP standard and also to detail the changes for the users perspective from the migration to WIS 2.0
3. DCS Introduction Video
   No progress
4. Manufacturers Workshop
   We have involved the manufacturers in the EDCP project and have been working closely with them. Not only have we moved forward with the EDCP but also established a closer relationship with the manufacturers. We propose to ensure we invite all agencies to each others workshops.
5. Discoverable information
   No progress

8 SMALL SAT

- **Introduction and Purpose**: NOAA and EUMETSAT, with JMA observing, demonstrated the operational use of the Data Collection System (DCS) by a LEO satellite, identifying its operational purpose and potential benefits. The successful launch and testing have determined that DCS can support satellites equipped with a DCS transmitter and thus provides an alternate approach for smallsats to use the UHF band in a shared manner with other DCS users.
- **TechEdSat-11 and Testing**: Since its successful launch on 4 July 2024, TechEdSat-11 has successfully transmitted DCS messages from a LEO platform, demonstrating interoperability with various DCPRs, specifically on GOES-E, GOES-W, Meteosat-10 and Meteosat-12. The satellite completed validation testing and achieved its project goals, including reliable message transmission and coordination with GOES and Meteosat DCPRs. Based on that success, the project is deemed to be operationally viable.
- **Mission Success and Achievements**: TES-11 achieved full success criteria by transmitting messages to multiple DCPRs, with performance meeting, and in some instances exceeding, mission goals. The satellite demonstrated long-duration error-free message transmission and reception, showing the ability to receive well at low power.
- **Challenges and Observations**: An unusual effect of “ghosting” and “smearing” of received transmissions has been observed, likely due to Doppler differences between the spacecraft and the Earth. This effect was not observed in ground receptions and is believed to be caused by signal reflections from the Earth's atmosphere or water.
- **Conclusion and Future Steps**: Satellite use of DCS has been successfully validated both conceptually and operationally. One more satellite is planned for launch this summer as TES-16. This satellite will be like TES-11, though larger (12U) than TES-11 (6U). TES-16 will use the new EDCP standard and offer an opportunity to test multi-satellite access to DCS. Next steps also include determining the policy and regulations for satellite use of DCS by respective organizations and the Coordination Group of Meteorological Satellites.

9 SCINTILATION

A study conducted by researchers at Boston College Institute for Scientific Research and supported by NOAA, looked at the feasibility of using DCS signal data to detect and study Ionospheric Scintillation (IS). GNSS radio occultation data is traditionally used for this purpose, so employing a DCS to investigate this phenomenon is a novel approach. The preliminary results of this research are favourable that in addition to traditional data relay services, a DCS can be used as an ionospheric scintillation sensor and potentially provide scientifically useful signal information to build prediction models. Positives for employing a DCS in this manners are that the UHF band is more sensitive to scintillation than GNSS, transmitters are globally distributed, and DCS infrastructure is distributed around the globe. On the negative side the transmissions from traditional DCS users are quite short and infrequent. Longer transmissions from

better defined data platforms may be needed to develop the requisite signal data for detailed analysis. However, modifying ground demodulation systems to account for signal characteristic during a broadcast and deploying new or using current DCP platforms is a fairly straightforward process. Costs are somewhat mitigated by fact that they are primarily associated with software implementations in the ground system and that new dedicated data collection platforms would not need the addition of environmental sensors.

This topic should be of interest to groups dealing in space weather, particularly ionospheric scintillation, given that the preexisting DCS infrastructures provide significant data gathering potential. The DCS task group proposes to look into this topic and provide more information to CGMS on it's potential and detailing a way forward.

Reference Document "Gannon Storm Scintillation Observations via the NOAA Data Collection System"

10 RADIO FREQUENCY INTERFERENCE (RFI)

Existing electromagnetic radio, increased use of the spectrum, and spectrum sharing are the sources of current and potential RFI. One of the dilemmas facing DCS operators is that sources of interference may originate from various terrestrial or space-based locations and in different frequency bands. Traditionally, the burden of identifying the impact of RFI, the location of RFI, the mitigation of RFI and removal of RFI, if possible, is the responsibility of the operator. In many cases, locating RFI on a hemispheric level is extraordinarily challenging due to available resources. Furthermore, reporting RFI to a regulatory agency requires that the report specifies the location. Thus, without a location the RFI cannot be reported and may not be considered for purposes of broader RFI awareness.

The Task Group on DCS has collaborated with the Task Group on RFI to discuss this issue and have determined that an RFI Register would be an appropriate method to document existing RFI issues being experienced by CGMS DCS operators. The first DSC RFI Register is enclosed with this report, and moving forward, it will be constantly updated and shared with the Task Group on RFI.

11 WIS 2.0

Discussions have taken place on the implementation on WIS 2.0 for DCS and also making and attempt to have a consolidated interagency report. Nothing concrete has been decided yet. EUMETSAT has not migrated to WIS 2.0. This is expected in Q3 2025.

12 DOCUMENTATION

The task group has reviewed the documentation under its responsibility. For the best practices (x2) there are no changes identified. The compliance to the best practices are covered under the individual agency reports.

For the DCS Handbook update will be needed to cover WIS 2.0, international DCS, Small Sat operations and EDCP. It is too early to include these yet as these items are not mature enough.

13 ACTIONS/RECOMMENDATIONS FOR CONSIDERATION BY CGMS-53 WGI

Action	Description	Action feedback/closing document	Deadline
A52.03	Work on the five proposals for DCS improvements based on the SWOT analysis, including work with RFI Task Group and DCS RFI register, DCS promotional materials presenting global view of DCS, improved DCS outreach via DCS introduction video, further work on EDCP standard, improvements to DCS user information across agencies.	26 Nov 2024: Progressing well with Enhanced DCP Standard.	CGMS-53
A52.04	Propose an interagency approach for DCS data access via WIS 2.0. Review also related changes to the Data Access Best Practice document.	26 Nov 2024: Early discussions. Wouldn't be in a position to have a separate report / BP by CGMS-53 WGI. Update on WIS 2.0 discussions in context of DCS will be included in the DCS TG report.	CGMS-53
A52.05	Present an overview of the various applications of DCS known across CGMS Operators.	26 Nov 2024: Has not been started yet. Attempt will be made to include something in DCS TG report, but EDCP is focus. Not ready for CGMS-53	CGMS-53
A52.06	The Task Group on DCS Satellite Operators to report on how their policies affect the usage of Smallsat.	26 Nov 2024: Two aspects: 1. UHF spectrum used by DCS is allocated only for ground-to-space agreement and space-to-ground, but not space-to-space (which is what Smallsat uses). If CGMS agrees this should be pursued, then this can be done via SFCG.	CGMS-53

		2. Each agency has use of conditions of DCS. Need to describe how these affect Smallsat, e.g. do policies have anything against it. The above two aspects will be covered in the DCS TG Report in WGI, with a proposal for next steps. Small sat progresses but the group is not in a position to cover this action yet. Some aspects are covered in section 8	
WGI/A52.07	The Task Group on DCS to work on DCS Handbook updates related to Smallsat.	26 Nov 2024: Still too early to include something on Smallsat in the DCS Handbook, as Smallsat is not operational yet and more work to be done on defining possible use cases. Another Smallsat launch planned in 2025 and actions on clarifying policies. DCS Handbook updates can be made for CGMS-54 earliest.	CGMS-54

CGMS is invited to take note of the Task Group on DCS activities and progress since CGMS-52, along with the proposed updated actions.

14 CONCLUSION

Since the creation of the WGI Task Group on DCS, progress has been made in improving the DCS. WGI is invited to:

- Endorse the proposal to further investigate the Ionospheric Scintillation and its potential use with DCS transmissions;
- Take note and comment on the status of DCS Task Group on DCS activities and progress since CGMS-52.