Report from the CGMS WGI Task Group on Data Collection Services

Presented to CGMS-54 WG-I session, agenda item 7.1

Coordination Group for Meteorological Satellites

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Executive summary of the WP

The primary task of the group has been to address the need for and make proposals for a new Enhanced DCP (E-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-53. The discussions of the E-DCP standard have continued and is a major topic for the group.

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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 EDCP 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.

TASK GROUP STRUCTURE AND MANAGEMENT ARRANGEMENTS

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

*Will be replaced. Details Pending.

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TASK GROUP STRUCTURE AND MANAGEMENT ARRANGEMENTS

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

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MEETINGS

Intersessional Meetings

The group has held regular intersessional meetings since the last CGMS report.

The intersessional meetings continued after CGMS-53 with a monthly frequency due to the discussions on the Enhanced DCP standard. There was a summer and winter pause.

We intend to continue with the same schedule in the future.

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.

ACTIVITIES

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.

TERMS OR REFERENCE

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

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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.

FACE TO FACE MEETINGS

There were no face to face meetings this year and the DCS workshop did not take place.

However, following discussions at the Meteorological Technology World Expo in Vienna (October 2025), the Task Group successfully re-established contact with Signal Engineering. During the Expo, conversations with other manufacturers confirmed that Signal Engineering remains a provider of DCP transmitters. After an email exchange between EUMETSAT and Signal Engineering contact lost in 2019 was restored. Since this reconnection, Signal Engineering has been very active in supporting the development of the Enhanced DCP (E-DCP) standard.

ENHANCED DCP STANDARD

- The Task Group continues to refine the initial EDCP Standard. Unfortunately, there is not a method or process to collectively resource a comprehensive plan for this project through CGMS. In the absence of 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.

ENHANCED DCP STANDARD CONT…

- 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 its capabilities with successful in-ground tests. Additionally, EDCP transmitters have been built by Microcom to be launched in future Small Sat missions (see dedicated section).

- While initial analysis suggested a potential need to reduce rates to 350/750 bauds, the group has confirmed that the standard will move forward at 400 and 800 bps. Analysis by Microcom determined that transmitting a full data header with every transmission added 0.13 seconds of overhead. While considered "acceptable," the Task Group has opted for a rotating field approach, as proposed by Signal Engineering. Instead of transmitting all metadata in every transmission, the system will cycle through various fields across different transmissions. These fields include: GPS Coordinates (latitude/longitude), radio health, firmware version, battery voltage and power status.

ENHANCED DCP STANDARD CONT…

- 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.

- The previous proposal for a multi-phase rollout (where headers were added only in late-stage Phase D) has been dismissed. The standard will now be defined in a single release:

    - **Phase A (Definition):** Introduction of BPSK (400 bps) and QPSK (800 bps) modulation, Forward Error Correction (FEC) elements, and the new rotating DCP header for metadata

    - **Phase B (Certification):** Formal certification as defined in Phase A

    - **Phase C (Operations):** Full operational deployment of the new standard

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

ENHANCED DCP STANDARD CONT…

The current revised schedule for the EDCP looks as follows:

2026

- 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
- 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

SWOT

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

- **RFI Mitigation**
  - See section 10
- **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. Collaboration with SEBA to develop a PR article for the EUMETSAT website to show the deployment of 200 DCPs in Tanzania
- **DCS Introduction Video**
  - No progress
- **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, in particular with the reestablishment of contact with Signal Engineering. We propose to ensure we invite all agencies to each others workshops
- **Discoverable information**
  - No progress

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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 small sats 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. Testing at various power and data rates, including specific tests at 1W and 1200bps, demonstrated that lower power level than originally thought could be used with acceptable error rates. Based on that success, the project is deemed to be operationally viable.

SMALL SAT CONT…

- **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. Future missions (TES-16 and TES-23) are being planned. TES-16 is a 12U satellite expected to be launched in summer 2026 or December 2026. TES-23 is scheduled for launch on 29 March and it will be placed into a GEO transfer orbit to further demonstrate DCS capabilities from different altitudes. Both missions will use EDCP format and carry a transmitter capable of both EDCP and legacy modes, ensuring compatibility with EUMETSAT reception even ground necessary changes are delayed. Next steps also include determining the policy and regulations for satellite use of DCS by respective organizations and the Coordination Group of Meteorological Satellites.

SCINTILLATION

- Interest in the space weather effect Ionospheric Scintillation remains relevant to CGMS DCS organizations. There is also academic interest in studying these phenomena. To that end, NOAA has coordinated with researches at Boston College and Florida State University to develop an “S” measurement that samples signal strength during a DCP transmission and produces an SDCS metric to accompany other DCS statistics. This SDCS metric has been deployed to the development system at the NOAA GS at Wallops Island, VA. GNSS RO data is traditionally used for this purpose, so employing a DCS to investigate this phenomenon is a novel approach.

- Preliminary analysis of datasets containing the SDCS metric are revealing interesting opportunities. For example, measurement differences between the NOAA site and a ground station operated by Microcom indicate that it may be possible to investigate Scintillation in both the DCP UHF uplink and the Geostationary Downlink by comparing data between ground stations. Furthermore, SDCS measurement coincided with recent solar flare events. Previously, the focus of SDCS was on Coronal Mass Ejections (CMEs) due to the longer lasting effects of the resulting geomagnetic storms. Using the SDCS to analyse the shorter duration acute effects of solar flares in new from a DCS perspective.

- Use, validity, and final application of this metric are still in very early stages but the SDCS metric offers the potential to provide data outage root cause information to DCS operators as well as supporting space weather organizations seeking free data from thousands of platforms transmitting through the ionosphere.

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 current DSC RFI Register is enclosed. NOAA was able to coordinate removal of two interference sources since CGMS Workgroup 53.

The Task Group on DCS has also drafted a CGMS Agency Best Practices in Planning, Monitoring, Mitigating, and Removing Radio Frequency Interference in Data Collection Systems (DCSs) for the Task Group on RFI.

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 summer 2026 by entering a parallel operations phase of at least 6 months to transition data flows from GTS to WIS 2.0. It will be necessary to categorize DCP messages into one of seven Earth system disciplines and adopt an MQTT-based retrieval process where, during a transition phase, base64-encoded DCP data is embedded directly in the notification messages.

- NOAA has not migrated to WIS 2.0. NOAA DCS representatives have been notified that the NOAA National Weather Service (NWS) has been tasked to migrated to WIS 2.0 by 2030. NOAA DCS will continue to collaborate with EUMETSAT and will coordinate with the NOAA NWS on their implementation plans for WIS 2.0.

ACTIONS

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
18 Mar 2025: See SWOT section

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
18 Mar 2025: EUMETSAT WIS2.0 parallel distribution (GTS and WIS2.0) is planned to start on Summer 2026

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ACTIONS CONT…

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

18 Mar 2025: The Task Group continues to prioritize the EDCP development; however, data collection for DCS applications is now underway. NOAA has compiled a web with "success stories". Simultaneously, EUMETSAT has initiated contact with several operators

ACTIONS CONT…

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
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.

18 Mar: No change

ACTIONS CONT…

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

18 Mar 2025: Handbook to be republished to reflect the EDCP standard and also to detail the changes for the users perspective from the migration to WIS 2.0

To be considered by CGMS:

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