126th GOES DCS Technical Working Group (TWG)
Tuesday May 10th and Wednesday May 11th, 2022
(Virtual Via WebEx and Teleconference)
Meeting Minutes

Administrative Notes:

Some presentations such as the Microcom briefs on Binary Standard and Automated Latitude/Longitude are best listened to on the audio/visual (vid) files in combination with the slide presentation. The location of the audio/visual and Powerpoint presentation are listed below.

If you download the .vid files to your computer, you can use the 10 second back and 30 second forward controls to better use the files with the slides.

The PowerPoint file for each presentation that have accompanying slides and the audio-visual or (vid) files can be found on NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html.

Day 1 - Session 1: May 10th, 2022:

Welcome and Logistics: William "Skip" Dronen - NOAA/NESDIS/OSPO/SPSD/ Direct Services Branch

This presentation starts at minute 0:06:15 on the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Skip Dronen opened the meeting at 11:00 EDT. He then presented the agenda for day one.

The presentation slide (s) (TWG Agenda Day 1) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

DCS Program Update: William "Skip" Dronen - NOAA/NESDIS/OSPO/SPSD/ Direct Services Branch

This presentation starts at minute 0:08:35 on the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Skip Dronen noted that he is new to NOAA and the DCS program and that he has been in his position since January 2022. He noted that he was a U.S. Coast Guard Officer and used GOES imagery and SARSAT services during his career. Skip continued by noting that DCS Operations and Maintenance Support Contract has transitioned to another NOAA contract vehicle and that Microcom is part of that vehicle. Also important to us is that the DADDS User Support will continue until September of 2023. That includes Habtam Ayalew, the DADDS database manager and Valerie Randall who supports Letecia Reeves in customer service roles.

Skip noted that GeoXO is a new and important program. We are coordinating with them almost daily. GeoXO is the future of our data collection system. We have held DCS open forums to solicit information from the user group on the impact of GeoXO and to define some requirements for the DCS system that GeoXO can use for their decision-making. There were 5 user fora. Skip presented a summary of his view of the findings.

- He noted that DCS has been around for decades. Users have built significant redundancy using the Direct Readout Ground System (DRGS) capability. NOAA also benefits from this as we use this to perform data validity checks.

- Reliance on terrestrial systems is not acceptable particularly for those who use operational data for real-time decisions. This is particularly true when there are adverse environmental conditions, which is when you need your data.
- There are concerns that there will be additional data hops that a (proposed) commercial re-broadcast may have to take. This drives reliability standards that may have to be considered in the future.
- There were questions on the commercial re-broadcast bands that might be used. Does Ku-band have rain-fade or other risks associated with it.
- Two-way communication is still desired. This has been demonstrated by users that have pursued their own two-way communications capability. Cost and reliability are still concerns.
- The bottom bullet on Skips slide "No explicit agreements or published requirements GOES DCS Program can leverage for GeoXO satellite tradeoffs" comes across strong but he has not been able to find any explicit agreement with our user group that he can hand to the GeoXO team that will help them make decisions. We have a lot of information and data but no formal agreement that covers everything.

Skip then reviewed the current DCS program project updates.

- Backup Pilot Antenna: The consolidated backup facility or CBU in Fairmont, WV is the home to our backup pilot antennas. The pilot signal is crucial for the whole DCS system. The original antennas did not work so there has been a multi-year effort to re-establish this capability for continuity of operations. The new antennas have been installed. We think this will be completed this summer.
- Communication Protocols: We are looking into implementing some changes that will reduce the size of most messages.
- DCP Position Reporting: We would like to implement this as an automatic function. This will aid in the accuracy of DCP positions. We could also add some other bits of information that could be included.
- Batch Updates: This adds the potential to update multiple PDTs at a time. This could result in a significant reduction in effort for users with many DCPs.
- DADDS Next: This is currently a multiyear funded project to upgrade the system. The cloud is part of it as NOAA is moving to the cloud. We are unsure to what degree we would move to the cloud. We could use this as an opportunity to finally improve DADDS and possibly to add two-way back into the system. DADDS Next might also be a proof of concept to show that this is a functional solution that can meet our reliability standards and to inform us of other directions to take the system.

Skip then followed with a review of the five open TWG actions:

TWG Action 123-3 (122-2): Investigate how to make configuration files available in the USACE DCP Monitor system.

- Update:
    - A presentation "USGS Configuration Depot Update" was given at the Fall STIWG by Laura Flight of the U.S. Geological Survey/Water Resources Mission. She stated that the replacement for DECODES, "DECAP," has been completed and a new version of the USGS Depot would be available by Spring with a beta version available soon.
    - A presentation "Update on a DADDS Configuration Repository for all DCP Users" was given at the FALL STIWG by Matt Ceanfaglione of Microcom Design, Inc. Matt Ceanfaglione briefed that Microcom has been approached to find out what it would take to be able to have users upload their configurations and store them in DADDS. This would allow all users to decode the data, as the SHEF data would then be known. Microcom has not gone forward to develop a work assignment yet.
    - In the near future, NOAA will consider implementing this project.

- Status: Closed to STIWG Action 127-3, which is In Progress.
    - "Move forward with an investigation on how a STIWG Configurations Depot could be accomplished." "This may be assigned to the Preservation Group or may have a working group of its own."

TWG Action 123-4 (from 122-3): As WCDAS puts WMO headers on 89% of messages and sends them to the NWSTG, consider putting WMO headers on all the messages; or assess whether we should be doing this at all by seeing if there are user requirements for this. This needs clarification or a statement of need then NOAA will scope the task.

- Update: All messages now contain a WMO header. The default header is Sxxx20 for all messages NOT transferred to the National Weather Service.
- Status: Completed and Closed

TWG Action 123-6 (122-8): DCS Program to prepare some vehicle for getting user input on the DCPI two-way communication project.

- Update:
    - There is an in-progress STIWG Action 127-9: Pursue Two Way as a program of record or included as a current requirement or currently active capability for DCS?
- Status: Completed and Closed.

TWG Action 123-7 (from 122-9): DCS Program manager to prepare a briefing for OSPO and NESDIS management on estimates of the costs to bring the DCP two-way communication project to completion for GOES-R Series and the next generation of satellites. NOAA and Microcom are in progress of executing a project.

- Update: This has been completed and communicated NOAA management.
- Status: Completed and Closed.

TWG Action 123-8 (from 122-10): NOAA to investigate back-up (remote) pilot options including reuse of Goddard equipment or a new system for the CBU. Short term project complete; long term solution in progress. Update:

- This is In Progress and is due to be completed in the late Spring of 2022 with the installation of new parabolic antennas at the NESDIS Combined Backup Site (CBU) in Fairmont, WV.
    - Status: In Progress. We are currently looking at the Summer of this year as we now have contract support back in place.

The presentation slide (s) (DCS Program Update Dronen) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

DCS Customer Service Update: Letecia Reeves - NOAA/NESDIS/OSPO/SPSD/ Direct Services Branch

This presentation starts at minute 0:09:17 on the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Letecia Reeves reviewed the new policy for channel assignment that was implemented last year.

- Assignments should only be requested for definite DCP deployments within 6 months and the units should already be purchased before requesting definite assignment.
- IDs that remain unused for one year will be reclaimed. Unused IDs are those that are new assignments whose DCPs have not yet transmitted.

    - This is a slow process that will take time but last year we reclaimed over 500 unused time slots.
- IDs that are inactive for 3 years are being reclaimed.
    - We have reclaimed almost 1000 of these time slots.
    - Before using an ID that has been unused or inactive for more than 1 year, consult the DADDS web page to ensure that it is still on an active channel. If you see parked next to the channel number, NOAA has already been reclaimed the ID and you need to contact Letecia (customer service) for reassignment.

Letecia then gave a presentation on how to determine the status of your DCP ID. In DADDS, under the platforms tab, filter on your group code. In the report, the STATUS column and the LAST ACTIVE column go hand in hand. If a platform is marked "D", for example, for inactive or de-active, look at the LAST ACTIVE column to see how long it has not transmitted. The code "U" it indicates that it is unused and has never sent a message. So, again, please consult the DADDS before using an ID that has been unused or inactive for a while. The status codes are shown below, in Figure 1.

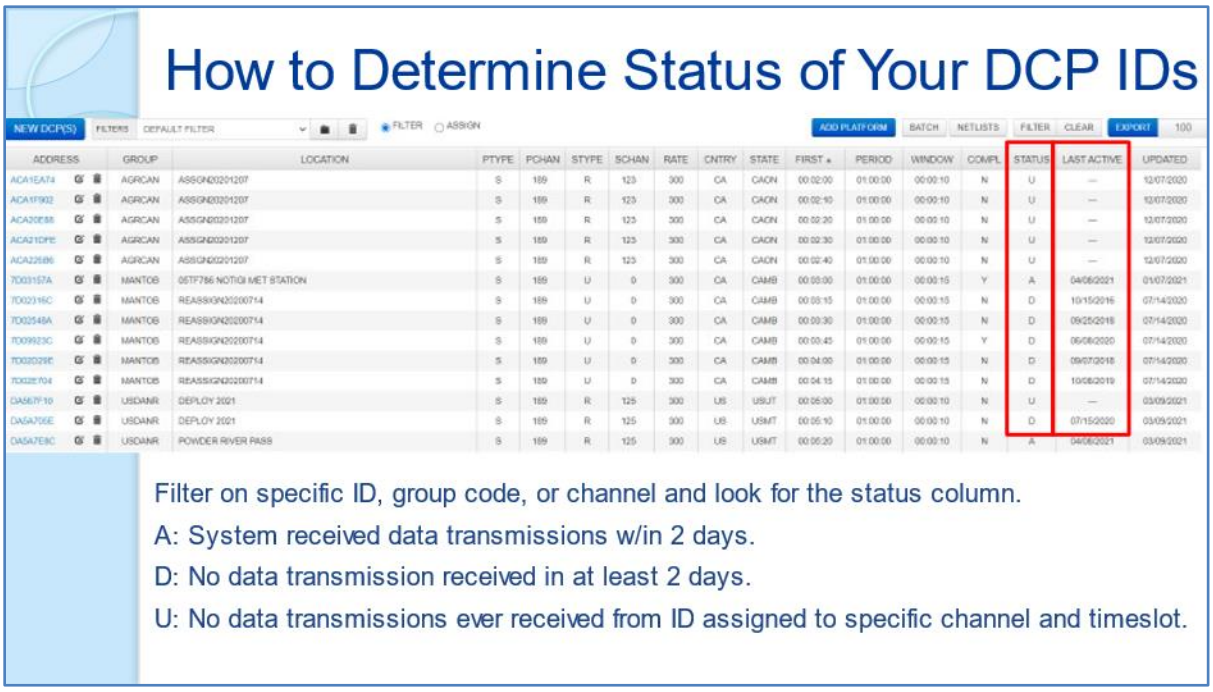

Figure 1: How to Determine Status of Your DCP IDs

- Filter on specific ID, group code, or channel and look for the status column.
    - A: System received data transmissions w/in 2 days.
    - D: No data transmission received in at least 2 days.
    - U: No data transmissions ever received from ID assigned to specific channel and timeslot.

Letecia then briefed the DCP transmitter status shown in Figure 2. She noted the number of "Unused" DCPs had decreased due to the new channel assignment policy.

DCP Status	100 Baud	300 Baud	1200 Baud	Totals
Active DCPs	0	30,747	542	31,289
Inactive DCPs	0	7,484	543	8,027
Unused DCPs	0	1,277	82	1,359
Totals	0	39,508	1,167	40,675

Figure 2: Certification Standard 2 (CS2) - Transition

Letecia continued by going over the progress on the transition from CS1 to CS2. There now 780 more CS2 transmitters since our update in December 2021. There are now 21,127 out of a total of 31,289 active DCPs that have been transitioned. We have four more years until the May 31, 2026 deadline for transitions. She briefed that CS1 transmitters should no longer be deployed.

Letecia noted that the DCS Field Test is now only accessible through a login. The link to access the field test is shown circled in red in Figure 3 from one of the DADDS servers. You will be taken to a page where you can register for a field test account. This is highlighted in green text and circled in red in the "Notice to Users" in the top paragraph in the "yellow" block in Figure 4. There is also a document containing best practices that will assist you to create approved scripts for automated data downloads. This will help avoid causing system failures. User accounts that misuse this feature will be deactivated. This link is shown in the bottom paragraph in the "yellow" block in Figure 4 under "Automation Notice."

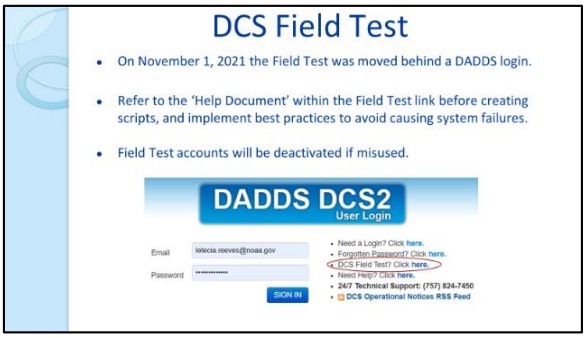

Figure 3: DCS Field Test Link Location

Letecia also noted the following:

- On November 1, 2021 the Field Test was moved behind a DADDS login.
- Refer to the 'Help Document' within the Field Test link before creating scripts and implement best practices to avoid causing system failures.
- Field Test accounts will be deactivated if misused.

Letecia continued by briefing that there were two successful PDT Weeks in June and December 2021. During PDT Weeks, we dedicate the time to encourage platform owners to log into the DADDS and update their Platform Description Tables (PDTs). We have noted for a couple of decades that it is important to update the PDTs. This benefits everyone. It is also a requirement. We have developed a visualization tool that will show the location of all of the DCPs on a map. This project is in the final stage, and we hope we can integrate this within DADDS. When all the PDTs are up to date, it benefits the National Weather Service. They access the data to produce event forecasting and weather warnings. When the PDTs are not updated, the Weather Service has to spend a lot of time contacting users to determine the platform's location. This year's PDT Weeks are scheduled for weeks of June 27th and December the 5th. We will be sending out notifications soon.

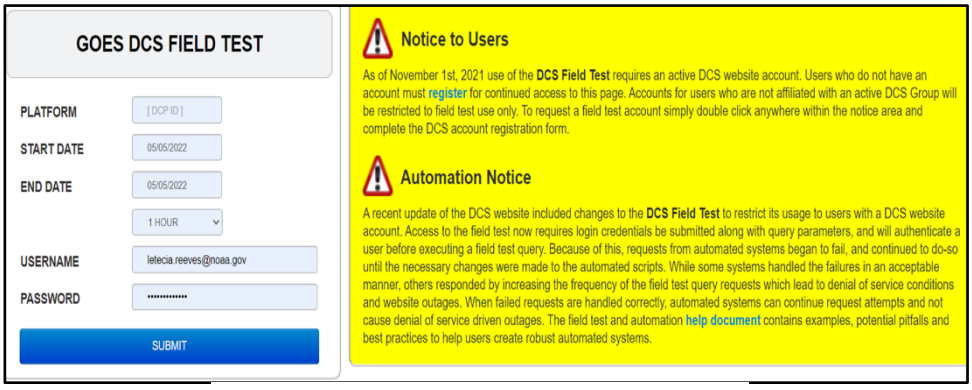

Figure 4: DCS Field Test Best Practices

At the conclusion of these meetings, NOAA will be working to prepare a full day of training to be held in conjunction with the Collective Madison Meeting which will be held in Madison, WI on August 8-12, 2022. The training will be held on Saturday, August 6th, 2022, the weekend before the conference. Letecia will be sending out a registration that will give an opportunity to provide topics that you would like to see covered.

The meeting was reminded that for password resets, you may be required to enter your security question. Please remember that the default answer to both questions is your last name plus a 4-digit PIN (Parker4411). This pin was created when you registered. If you cannot remember your pin, contact the 24/7 Wallops Help Desk at 757-824-7450.

The next topic was "Guides and Tutorials". If you click on the system information tab (see Figure 5), on the left side on the graphic from a DADDS server where it is circled in red, you will find documentation and tutorials that are useful to users. This is where the tutorial on updating PDTs can be found. GOES DCS Test Channels. Letecia noted that following is the list of the test channels.

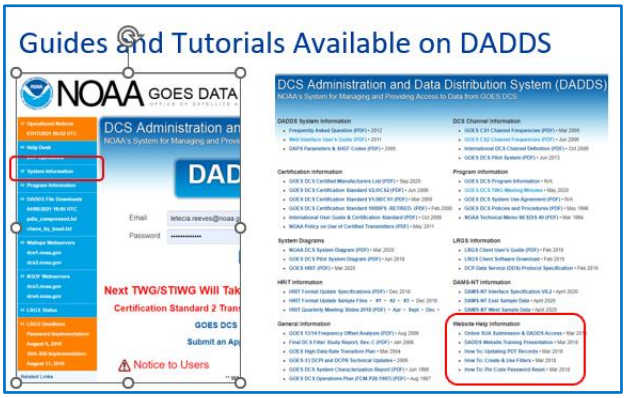

Figure 5: DADDS Web Page on Guides and Tutorials

- GOES East 300 bps - CS1 & CS2 = Channel 195 (401.99200 MHz)
- GOES West 300 bps - CS1 & CS2 = Channel 196 (401.99350 MHz)
- GOES East and West 1200 bps - CS1 = Channel 99A/197 (401.99500 MHz)
- GOES East and West 1200 bps - CS2 = Channel 198 (401.99650 MHz)
- Please note: CHANNEL 151 should NO longer be used

Letecia noted that they are working on updating the information available on the DCS web pages.

Letecia closed by noting that users needing help or with questions should contact DCS Customer Service at the contacts below.

- Letecia.Reeves@noaa.gov
- Valerie.Randall@noaa.gov
- Wallops 24/7 at 757-824-7450

The presentation slide (s) (DCS Customer Service Updates Reeves) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

Wallops Update: Matt Sullivan - NOAA/NESDIS/OSPO/WCDAS

This presentation starts at minute 0:30:14 on the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Matt Sullivan began by reviewing the GOES spacecraft. He noted that the two primary operational spacecraft are GOES-16/East and GOES-17/West. There are three of the older series of satellites still in operation. They are GOES 13, 14 and 15. GOES 14 and 15 are in storage orbits and can be used as backups to the current operational satellites. GOES -13 was transferred to the U.S. Space Force to support operations. It is located over the Indian Ocean. It is used by the Space Force to provide imagery and products for that theater. It is now named EWSG-1.

He noted that NESDIS is in the process of post launch testing on GOES-T/18. Following testing, the spacecraft will drift to a co-location orbit near GOES-17/West. In early 2023, at the conclusion of additional testing and co-operation procedures with GOES-17, GOES 18 will replace GOES 17 as GOES West. It was noted that WCDAS completed the radio frequency communications part of the post-launch testing, including the DCS transponder.

Matt continued by presenting the GOES East and West positions and relative footprints. This can be seen in Figure 7. He then showed a graphic of the GOES-R frequency plan. The plan is shown in Figure 6. Matt noted that the top row on the graphic are the frequencies that are transmitted from the spacecraft down to the receive sites. He noted that the DCPR, which is the DCS receive signal, operates in the L-band portion of the downlink and that in within the 1679.7 to 1680.4 MHz. In the bottom portion, are the uplink frequencies. The DCS portion is the DCPR uplink, which are the platforms in the field, which operate in the UHF frequency range 401.7 to 402.4 MHz.

Matt continued with an overview of the parabolic antennas that are operational for receive and transmit located at Wallops Island, VA and at the consolidated backup facility or CBU at Fairmont, WV. These are 16.4-meter, hurricane rated, parabolic antennas. There are currently three HR antennas at WCDAS (HR4, HR5, and HR6) and three at CBU (HR7, HR8, and HR9) capable of supporting the GOES R series spacecraft. Their receive and transmit characteristics are the following.

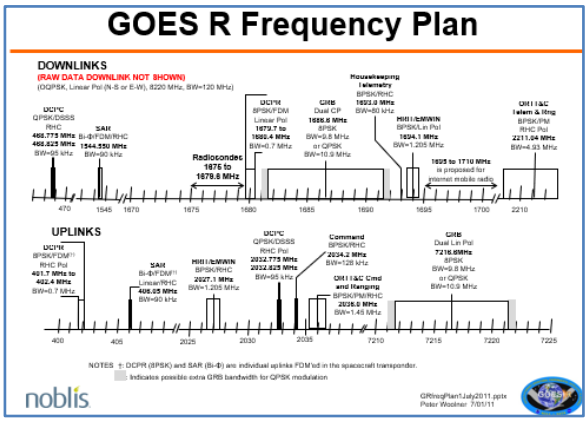

Figure 6: Current GOES Series Footprints

- Rx Capability
  - 1670-1695 MHz (L-band)
  - 2200-2240 MHz (S-band)
  - 8100-8350 MHz (X-band)
- Tx Capability
  - 2025-2050 MHz (S-band)
  - 7208-7225 MHz (X-band)

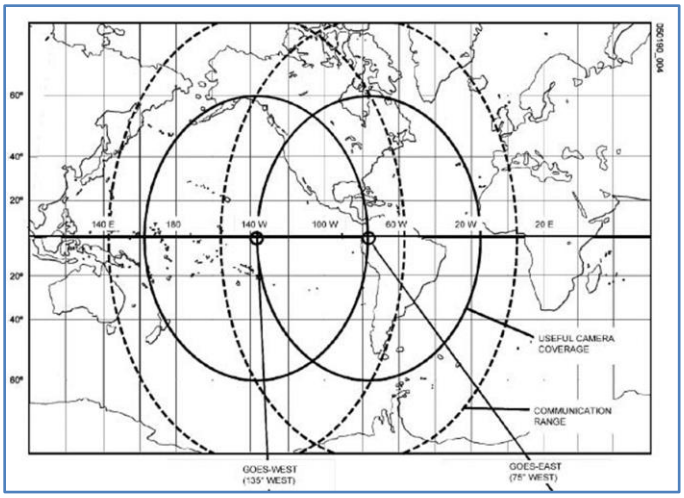

Figure 7: GOES-R Series Frequency Plan

There are also two legacy HR antennas at WCDAS (HR1 and HR2) that are currently undergoing upgrades and enhancements to facilitate GOES R support. The upgrades are currently scheduled for completion in the Spring to Summer of 2022. WCDAS also supports the DCS pilot uplink antennas. They uplink at 401.85 MHz. The three primary 3.8-meter antennas are located at WCDAS. They are primary East, West and a spare that can be used as a backup. Matt noted that the there are two backup sites. The CBU is a full backup for all GOES missions and systems except the DCS receive ground system, which is located at the NSOF in Suitland, MD. There is a tentative plan to move the NSOF equipment to the CBU site in late 2022. Matt then reviewed the project to replace the DCS pilot antennas at the CBU in Fairmont, WV. They will be replaced with similar antennas to what are at

WCDAS. Earlier this year, we broke ground on this project and installed the antennas, electronics and transmitter shelter. The next and final step is to move the pilot uplink transmitters from the CBU operations building to the shelter. This is currently scheduled to occur in June of 2022 (note that as of this writing, the completion date has been moved to the Summer of 2022 due to contract issues).

Matt continued with a presentation of DCS message dissemination to the users. This does not include the direct readout or DRGS stations.

- NWSTG: This is a dedicated line and data stream to the NOAA National Weather Service (NWS) telecommunications gateway or NWSTG. All messages now have WMO header. Both Wallops and NSOF can send the data. The operators at WCDAS can switch which stream is flowing to the NWSTG.
- WCDAS maintains two LRGSs. They are CDADATA and CDABACKUP. The NSOF also has two that are named NLRGS1 and NLRGS2. In addition, there is a third site that offers public servers. This is a USGS site at the EDDN located in Sioux Falls, South Dakota.
- The HRIT/EMWIN broadcast is a GOES-R series broadcast that is downlinked in the composite L-band downlink on GOES East and West. It contains imagery, Emergency Managers Weather Information Network (EMWIN) products and all DCS messages. HRIT is broadcast over the entire GOES footprint. It replaced the old DOMSAT service. Users can receive HRIT via a 1-1.2-meter antenna. Matt showed two links for further information on HRIT.
    - https://noaasis.noaa.gov/GOES/HRIT/about_hrit.html
    - https://www.goes-r.gov/users/hrit.html
- The DADDS or DCS Administration and Distribution System is unique in that in addition to providing message data, it used by the NOAA DCS Program Office to run and administer the functions that keep the DCS system running and operating correctly. There are four 4 web servers. If you use the URL https://dcs1.noaa.gov, you are able to replace the 1 with either 2, 3 or 4 to access any of the four servers. Generally speaking; servers 1 and 2 are located at WCDAS and 3 and 4 are at the NSOF. Matt noted that on DCS servers 1-4, there is a systems information tab on the left. There is a wealth of knowledge and information available on this page. Some examples are how to register for an LRGS account, download the latest OpenDCS software, how to download messages from the LRGS's, information on accessing the DADDS system and general DCS information. You can also access the GOES DCS System Diagram that describes the DCS data flow.
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Matt presented a DCS WCDAS customer service technical support contact's slide. It is staffed at WCDAS 24x7x365. Please reach out to WCDAS with any operational or technical questions.

- Wallops Help Desk: 757-824-7450, wdcs@noaa.gov
    - 24/7 Technical Support for DCS, LRGS, DADDS, HRIT
- Travis Thornton: 757-824-7316, joseph.t.thornton@noaa.gov
    - WCDAS Operations Shift Supervisor
    - DCS Operations Team Lead
- Matthew Sullivan: 757-824-7360, matt.g.sullivan@noaa.gov
    - DCS RF Systems Specialist
    - WCDAS Frequency Spectrum Manager

Matt also noted, in conclusion that there is an acronym list on the slide presentation.

The presentation slide (s) (Wallops Update Sullivan) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

HRIT/EMWIN Update: Ian Avruch - NOAA/NESDIS/OSPO/SPSD/ Direct Services Branch

This presentation starts at minute 1:07:00 on the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Ian Avruch introduced himself as this is his first TWG meeting. Ian then noted that HRIT/EMWIN is a combination of the legacy LRIT and EMWIN broadcasts. HRIT has a higher bit rate than the sum of the two legacy broadcasts. He then briefed the technical description of the broadcast signal. They are shown in Figure 8. The HRIT downlink center frequency is 1694.1 MHz with a bandwidth of 1.205 MHz. This frequency allocation is protected in some Federal sites. He has heard some comments from users that there have been problems with interference. So far, it has not been serious but has been very annoying. He welcomed users to contact him, and he can share information on the combined user experience. He noted that L-band does not require a large dish. Above ten degrees, 1-meter is sufficient. It is easy to aim and is not too obscured by atmospheric effects or intervening objects.

Characteristic	HRIT/EMWIN Broadcast Specifications
Platform	Operational East and West GOES-R Series Satellites
Operating Frequency Range	L-band
Center Frequency	1694.1 MHz
Data Rate	400 kilobits per second (Kbps)
Symbol Rate	927,000 symbols per second (sps)
Modulation	BPSK
Polarization	Linear – Vertical offset
Antenna System	At 5 degree elevation, the minimum antenna is 1.2 meter. At 10 degrees or more, the minimum size is 1.0 meter

Figure 8: Description of the HRIT/WMWIN Downlink Signal

Ian went over the bandwidth management. There are three categories of information. These are prioritized. The highest priority is the EMWIN products and text messages that are important to disaster managers. DCS messages are second in priority. The DCS messages come from DADDS and are buffered into eight kilobyte files that contain several messages. The broadcast is rounded out by imagery from the GOES, EUMETSAT or JMA spacecraft. The broadcast is operated at near 100%. The guaranteed percentages for each type of file and their priority are shown in Figure 9. Ian then went over the virtual channel description. The channel description table is shown in Figure 10. Although the East and West broadcast are similar, there are some differences. GOES-15 imagery is added to support the eastern Pacific region during period when GOES-17 heat flux problems. This last happened during a four-day period in February 2022. He noted that in Figure 10, imagery products are outlined in green (channels 1-17), the EMWIN in orange (channels 20-22) and the DCS in red (channels 30-32).

PDA Product Group Name	Guaranteed Bandwidth	Maximum Bandwidth	Group Order Rank
EMWIN	8%	50%	1
DCS	**5%**	**20%**	**2**
Imagery	87%	100%	3

Figure 9: HRIT/EMWIN Broadcast Stream Groups

HRIT/EMWIN Virtual Channel ID and Group Listing

VCID #	Product Name	GOES-16 Availability	GOES-17 Availability	Period -Min	Format	Resolution	Product Source Information
0	Admin Text	X	X	60	Text Messages	N/A	Active and available
1	Mesoscale Imagery	X	X	15	HRIT/LRIT	0.5km Band 2, 2km for bands 7 and 13	Active and available
2	Cloud Moisture Imagery Band 2	X	X	30	HRIT/LRIT	2 km	Active and available
5	GOES-15 WV Imagery		X	30 - 180	LRIT	4 km	Unavailable
6	GOES-15 IR Imagery		X	30 - 180	LRIT	4 km	Unavailable
7	Cloud Moisture Imagery Band 7	X	X	30	HRIT/LRIT	2 km	Active and available
8	Cloud Moisture Imagery Band 8	X	X	30	HRIT/LRIT	2 km	Active and available
9	Cloud Moisture Imagery Band 9	X	X	30	HRIT/LRIT	2 km	Active and available
13	Cloud Moisture Imagery Band 13	X	X	30	HRIT/LRIT	2 km	Active and available
14	Cloud Moisture Imagery Band 14	X	X	30	HRIT/LRIT	2 km	Active and available
15	Cloud Moisture Imagery Band 15	X	X	30	HRIT/LRIT	2 km	Active and available
16	G16 CMI Band 13		X	60	HRIT/LRIT	4 km	Active and available
17	G17 CMI Band 13	X		60	HRIT/LRIT	4 km	Active and available
20	EMWIN - Priority	X	X	Variable	Text	N/A	Available
21	EMWIN - Graphics	X	X	Variable	Graphic (e.g. GIF, JPEG)	N/A	Available
22	EMWIN - Other	X	X	Variable	Text and Graphic	N/A	Available
24	NHC Maritime Graphics Products	X	X	Variable	Graphic (e.g. GIF, JPEG)	N/A	Active and available
25	GOES-R/S Level II Products	Not Available	Not Available	Variable	HRIT/LRIT	2-10 km	Active and Available
30	**DCS Admin**	**X**	**X**	**Continuous**	**Text**	**N/A**	**Active and available**
32	**DCS Data**	**X**	**X**	**Continuous**	**Formatted Text**	**N/A**	**Active and available**
60	Himawari-8		X	60	LRIT	4 km	Active and available

Group Legend
- EMWIN
- DCS
- Imagery

Figure 10: HRIT/EMWIN Virtual Channel ID and Group Listing

Ian showed the products that are available on the EMWIN channel, including text products and graphic products. The product list is shown in Figure 11. He also noted that the imagery is the lowest priority. The latency varies widely as we provide imagery on a time schedule not on an as available schedule. Some products are acquired immediately and some with a small amount of latency. For DCS messages, the average latency is a bit less than 10 seconds. For messages with a latency of 60 seconds or less, the latency accuracy is 99.997%. This latency is measured from the DCS timestamp. The average availability of DCS message files is greater than 99.5%. One caveat is that this statistic only applies to the HRIT system as issues upstream from HRIT can affect this number.

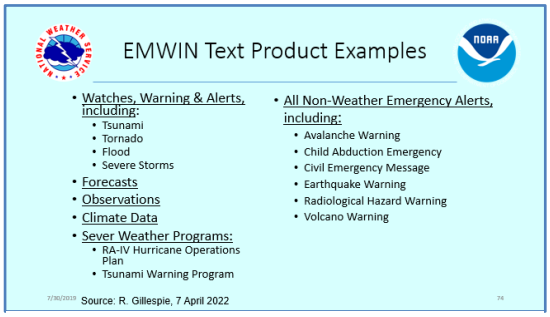


Figure 11: EMWIN Text Products Examples

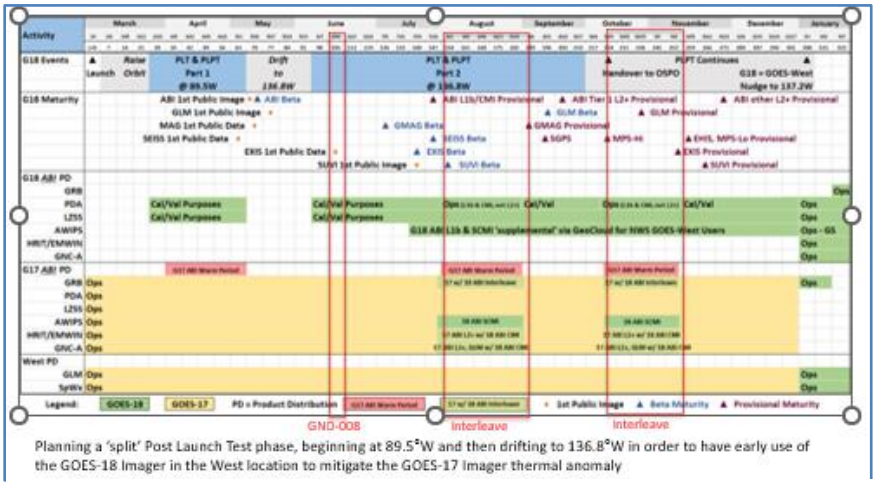


Figure 12: GOES-18 transition periods. Imagery will come from GOES-17

Ian continued by showing how the transition to GOES-18 will affect DCS operations. GOES 18 will drift from 89.5 West to 136.8 degrees West from May 18th to June 6th. There will be periods where it undergoes testing. There will be periods where HRIT imagery will be populated by GOES 17-imagery or will be interleaved with GOES-18 imagery. During these periods, GOES DCS will not be impacted. Ian then presented a slide showing the GOES-18 transition to operations schedule. There are three periods blocked in red where the imagery on HRIT will be from GOES-18 and not GOES-17 imagery. This is shown in the Figure 12.

Ian then presented a discussion on GeoXO. Before he began this discussion, he noted that it is important to remember that the GOES-R series is in the middle of its operational life. GOES-T has just been launched and GOES-U is expected to be launched in 2024 with an expected life to 2039, thus the GOES-R series has a lot of life ahead of it. It is important to note that GeoXO was formally instituted on November 9th of 2022. According to the timeline, GeoXO is in a requirements definition phase and will soon enter a formulation phase. The start of operations will be near 2033. Ian continued with a description of the 3-satellite GeoXO constellation where there will be a GOES-East and GOES-West, along with a central bird. This is shown in Figure 13.

Figure 13: Recommended GeoXO Satellite Constellation

GeoXO will not carry a HRIT/EMWIN transponder for direct broadcast. The HRIT/EMWIN program will persist but will be delivered over terrestrial internet or commercial re-broadcast. As the scientific data volume will be something like ten times of the GOES-R series, the thought is to leverage the improved terrestrial networks and commercial broadcasts to supply data to users. The intention is to match or exceed the reliability of the current HRIT broadcast. This includes the replacement for the current GRB broadcast. Ian noted that there is no explicit requirement for reliability, latency, or reliability for HRIT/EMWIN delivery to users, which has been identified. We rely on users to help define the requirements. Two meetings have been scheduled for users. He is requesting input on what users' actual requirements are so they can be brought to GeoXO.

Ian finished up by showing a slide with the points-of-contact for HRIT/EMWIN, which is shown in Figure 14.

Figure 14: HRIT/EMWIN Broadcast Points of Contact

Questions and Answers:

The Question and Answers for this presentation begins at minute 1:25:48 of the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Question - LySanias Broyles: Can we assume you need requirements on the reliability of how the data will be delivered as well as volume of the data to users?

Answer – Ian Avruch: We need numbers like latency for DCS or EMWIN but also information on your geographic location which may be high latitude or in the tropics where commercial satellite broadcasts like Ku-band are not reliable due to rain fade or where the footprints do not reach you. He would like to receive information from users on their use cases, like rain fade being an issue or the receive stations may not be portable enough. You can contact Ian and/or attend the two meetings. There will be WebEx invitations. Send Ian an email if you are interested in receiving the invitations.

Comment – Dave Lubar: People should use the NASA address to contact Craig Keeler: craig.a.keeler@nasa.gov.

The presentation slide (s) (HRIT_EMWIN Avruch) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

Small-Sat Update: Beau Backus - JHUAPL, supporting NOAA Satellite and Information Service

This presentation starts at minute 1:31:31 on the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Beau Backus began his presentation by noting that they are developing a satellite DCS Use Concept. We believe that the frequency environment for our DCS uplinks from the DCPs is changing due to the growth of small-sats. They are using the frequency in a space to ground direction. This is opposite of our ground to space use and normally this would not cause a problem and would be compatible, but the small-sats use omni-directional antennas so the energy that they transmit to ground also travels toward our DCPR uplinks.

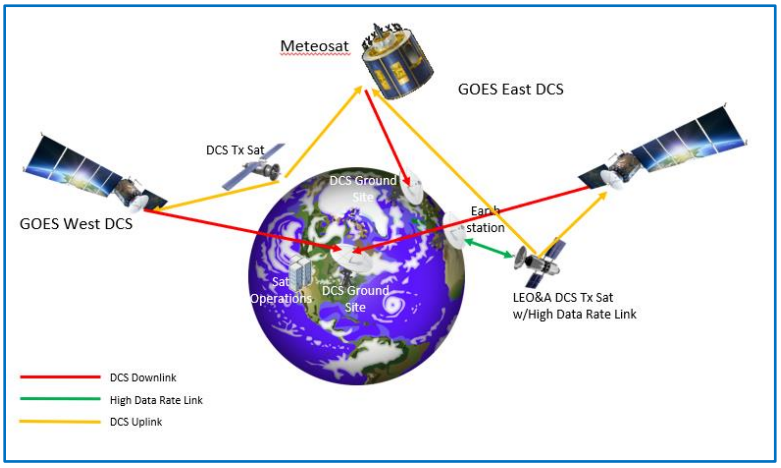


Figure 15: Concept: Use of DCS for Satellite Telemetry, Tracking and Small Data

The concept of "Use of DCS for Satellite Telemetry, Tracking and Small Data" is that we could put a DCS transmitter on the satellites so they could use the DCS just as DCPs use them. Thus, they would transmit, and the data would be picked up by any of the DCPRs on GOES-East, GOES-West, Meteosat and possibly even Himawari. One note is that DCS is a low data rate. If the small-sat have a high data rate need, in addition to the low-rate signal, they would have to have a separate link. This is shown in Figure 15, along with the general concept.

Beau continued with the list of benefits and the purpose for the satellite DCS use project. The list is shown below.

- Identified as a risk mitigation factor in partially protecting DCS users from aggregate RFI resulting from the increased use of the 401-402 MHz band.
- Determine if the Data Collection System (DCS) can support satellites equipped with data collection platforms (DCPs).
- Provide an alternate approach for small-sats to use the UHF band (401-402 MHz) in a shared manner with other DCS users.
- Enable use of DCS for satellite derived climatology and meteorological data.
- Establish increased use of international DCS channels and interoperability with other DCS service providers.
- Provide sufficient data for NOAA and the CGMS to determine if use of DCS by satellites is to be made available and, if so, the requirements necessary for it to be granted.
- Use of DCS by satellite systems will enable low-data rate communications from any point in orbit to satellite ops team at any time.

Beau went over the satellite DCS use concept validation project status. The original validation was done with a 6u 6x1 (u=10cm x 10cm x 10cm cube) satellite, TechEdSat-10, which showed that it worked and that we could overcome the doppler effect. The follow up satellite will be TechEdSat-11 which is a 6x3x2 satellite will be used to validate an operationally capable use in cooperation with EUMETSAT. We plan to show how well this approach can be used in an international environment.

Beau reviewed the results of the TES DCS mission. TES-10 was a proof-of-concept experiment conducted multiple times. We put data through the system and were able to transmit data from TES-10 to GOES and back to the mission operations team. As of August 20, 2020, we achieved success. TES-11 will be in a near polar orbit. We will be looking at experiments that have longer interactions with the DCPR and possibly being able to do handoffs between different satellites including with international partners. We are also looking to do an extended message transmission and could also transmit actual satellite operational parameters. Beau noted that we expected to launch on Landsat-9 satellite in September 2021, but we were de-manifested due to a failure in satellite testing. This gave us a full year of launch slip. We are now manifested on an Astra vehicle due to launch from Kodiak, Alaska. We will look at having a near polar orbit with an inclination of about 85 degrees with an altitude of 490 kilometers. The launch is schedule for August 4th,2022

The testing will be done in four phases to demonstrate aspects of potential operational scenarios. There will be tests of long periods of visibility, to see how power holds up and to see how data moves from one DCPR to the next. We will also test cases where transmission occurs when seen by two different systems simultaneously. We will also investigate details like demodulation performance for each of the systems. There will be transmissions at 100 baud and 300 baud to GOES, moving between different platforms. The phases are listed below.

- Will demonstrate aspects of potential future operational scenarios as well as on-orbit performance characterization using the two DCS platforms:
    - The number of commands available to configure the Microcom DCS transmitter on-board TES-11 have been significantly expanded allowing operation in modes and frequencies not possible with TES-10.
    - The near polar orbit will allow long periods of visibility where Doppler correction is not needed. Phase I and Phase II will utilize Doppler correction off and Doppler correction on (respectively).
    - Phase III will investigate use cases where data transmission occurs when TES-11 can be viewed by two different systems.
    - Phase IV will investigate additional details of demodulation performance for each of the systems.

- For TES-11 we will have capability to conduct multiple campaigns, involving GOES and Meteosat together demonstrating the concept for DCS to provide practical, continuous, and global communication from LEO satellites.

Beau followed with a description of the iDCS channel use concept. If we set the transmission to channel 6, its doppler shift will be between channels 3 and 9. This will be random access that will allow for other uses as well. These points are listed below, and the channels are shown in Figure 16.

- DCS channels are used either by fixed timing or random access (Alert Mode)
  - Random permits changing data Tx rates
  - Satellites best for random access channels
    - Allows for Doppler shift in frequency
- Would fit in iDCS channels as shown
  - Both terrestrial and space users can share channels
  - May need to relocate some incumbent users, which don't require the unique iDCS capabilities, out of the iDCS channels
- Note that Satellite Shared Use Channels Are Channels 3-9

Ch #	Use	Frequency (MHz)
1	Fixed	402.0355
2	Fixed	402.0385
3	Random	402.0415
4	Random	402.0445
5	Random	402.0475
6	Random	402.0505
7	Random	402.0535
8	Random	402.0565
9	Random	402.0595
10	Fixed	402.0625
11	Fixed	402.0655

Figure 16: IDCS Channel Use Concept

One question is how to seamlessly move data between satellites and each of the different users: NOAA, EUMETSAT or JMA. One approach would be to establish a cloud type interface that the data could be pushed to by each of the organizations which the users could then access. This is diagramed in Figure 17 below.

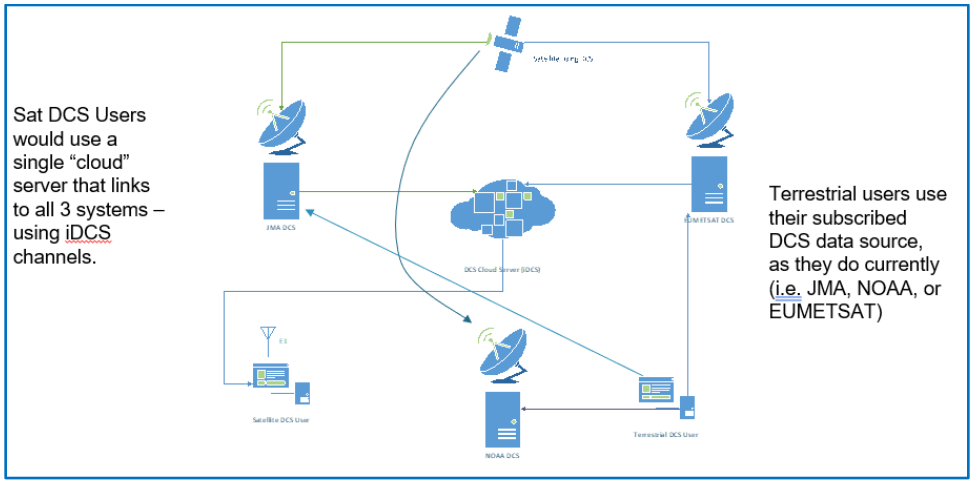


Figure 17: Possible Cloud Interface Concept to Provide Single Source Satellite Data Interface

The following points are a summary of the conclusions to date.

- DCS systems have been under pressure from small satellite constellation companies that wish to increase use in this band for space operations. That increased usage leads to increased interference as we saw from the Greenhouse Gas Satellite transmission from Canada.
- Satellite use of the DCS system is expected to alleviate some risk and further strengthen the value of protecting the system. They are working with us instead of producing interference.
- Satellite use of the DCS may also foster a new means for collecting and distributing meteorological and climatology data.
- The initial concept for Satellite use of DCS has been successfully validated through TES-10.

    - The concept is valid and DCS can be utilized to some degree by satellites.
- The launch and operation of TES-11 will provide a more significant validation of the operational challenges of this concept.
    - The TES-11 demonstration will be complete by the end of 2022, if our launch occurs as expected.
- Once this second stage of our project is completed, then the more important and challenging phase of determining policy by the respective organizations and CGMS.

Questions and Answers:

The following question by Jim Conrad actually occurred at 1:37:37 on the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Question - Jim Conrad: Will this fit within the "Redbook" table of allocations or will in require a change?

Answer – Beau Backus: Yes. We are operating on an experimental license. We will need to update NTIA and ITU tables to reflect the space-to-space use.

The presentation slide (s) (Small-Sat Update Backus) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

Day 1 - Session 2: December 10th, 2022:

Binary Standard: Brett Betsill - Microcom Design

This presentation is best listened to in combination with the slide presentation. The location of the audio/visual and Powerpoint presentation are listed below.

- *This presentation starts at minute 2:04:40 on the audio file "Day1 1455 TWG Meeting-20220510 (vid)".*
- *The presentation slide (s) (BinaryMessage Standard Betsill) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html*

Brett Betsill began his presentation on a binary standard for GOES DCS by noting that ASCII has been the DCS standard since its inception in the late 1970's and 1980's. Pseudo binary has also been used. Interest in a binary standard has been mentioned since the high rate started coming out in the late 1990's and early 2000's It was also mentioned in the CS1 and CS2 standards, but there has never been a fully defined standard. Several approaches were submitted by the DCS manufacturers. Sutron (now Ott), Signal Engineering and Microcom all submitted recommendations. In the 2005 era, the USGS had the EDDN Binary Transmission Project. The last time there was serious discussion of this was at the 2012 TWG. Since that time, it has continued to be a topic but has been discussed informally.

Microcom has recommended Binary in their yearly recommendation for projects, but it has always been a low priority. Microcom has always recommended that if this is to become reality, NOAA needs to take the lead. In September of 2021, NOAA decided to move forward with a work assignment that would 1) take a fresh look at the analysis of pros and cons compared to what was proposed historically and 2) develop a true proof of concept demonstration that transmits data through the satellite. Microcom completed the tasks between November 2021 and February 2022.

To complete the "fresh look" at a binary standard, Microcom tasked Dr. Brian Kopp, who has supported the Florida Department of Transportation, which is a DCS user, and Matt Taylor, who has worked for Microcom and been involved with DCS for many years. Neither of them had any familiarity with the prior work on a binary standard. Before beginning, a technical interchange meeting was held with NOAA to get their ideas on what their goals were. In the end, NOAA recommended that they do not want to specify the standard to a great deal of detail. It is up to the users to define how they want to convey their environmental data. NOAA's mission is to provide the satellite link. Right now, the users cannot use binary data, so it is a restriction on the users. NOAA wants to remove the restriction to allow users flexibility.

Final recommendations were presented to NOAA in early January of 2022. The following are the three key recommendations presented. They are copied below from the Microcom Design slide presentation with some added notes from the meeting.

- Message Length (Include a message length field). This was common in the three proposals from 2005.
  - Use message length in place of EOT. This has been a long-standing limitation.
  - For CS2 we need 14-bit message length field.
  - BCH block encoding scheme to protect message length and original Flag byte. This adds additional error correction.
- CRC-16
  - Append 16-bit CRC to data field to replace Odd Parity bits in each byte as was used in the Pseudo-Binary and ASCII formats.
  - Recommended the use the code polynomial (0xd175 = $x^{16}+ x^{15}+ x^{13}+ x^{9}+ x^{7}+ x^{6}+ x^{5}+ x^{3}+x+1$"
- Reduced Flush

- Originally, Microcom believed it was possible to eliminate the flush entirely, due to the fact that the message length would be known.
- However, implementation and testing showed that a 16-bit flush is needed instead of the current HDR specification requires 32 bits of flush.

Figure 18 is an example of a comparison of the proposed binary protocol with the current Pseudo-Binary DCPRS Format. The differences are shown highlighted in yellow in Figure 18.

- Top row is how to format in ASCII or Pseudo-Binary from the current certification specifications.
- The middle row is the "proposed 300 bps Binary DCPRS Message Format."
- The bottom row is the "proposed 1200 bps Binary DCPRS Message Format."
- The first 5 fields will remain the same in both the 300 and 1200 examples.

Note that in the proposed 300 bit-per-second format there would only be one CRC as there is a maximum message length is 32,000 bits. For a 1,200 bit-per-second format message the length can be 4 times what is in a 300 bit-per-second, thus there will be multiple CRC's, one for each 32,000 bits of message data.

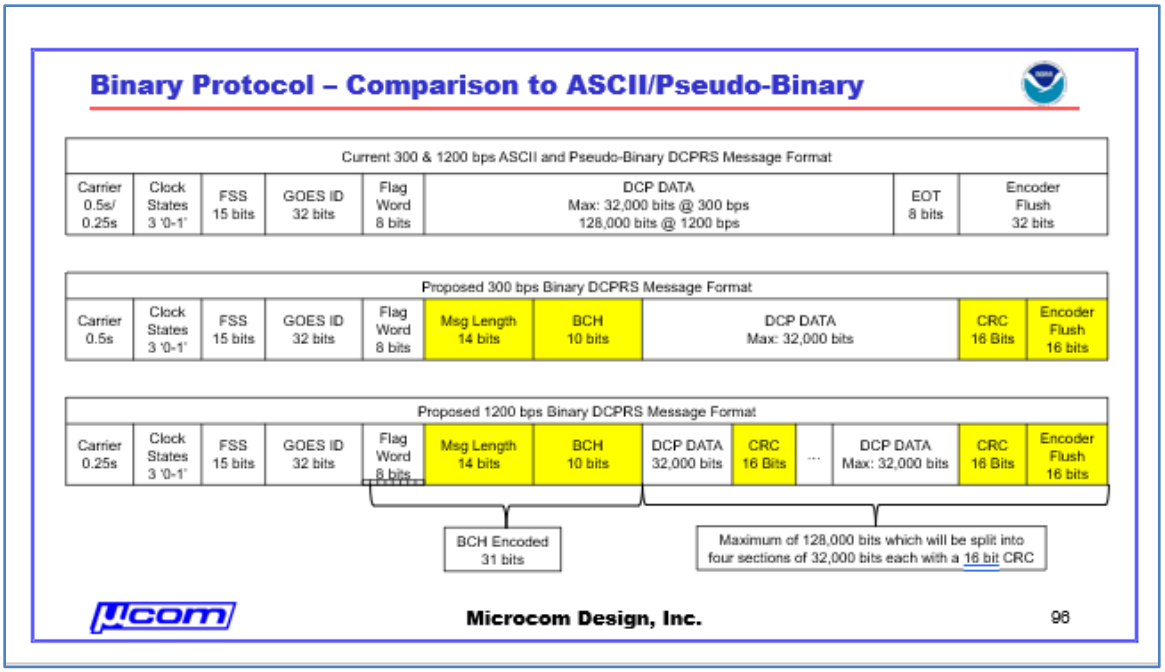


Figure 18: Microcom Design's Proposed Binary Standard Solution Diagram

Brett continued providing more details including the BCH Protected Length (Bose, Chaudhuri, and Hocquenghem). A description of this in shown in Figure 19. The characteristic that the most significant bit in the flag word should be set to odd parity as it acts as an extra check bit will be preserved. This scheme allows you to send 21 bits of information with 10 check bits which allows you to fix every combination of two-bit errors and detect most 3-bit errors. The flag word would essentially remain the same. The 2 bits that are used to specify ASCII, Pseudo-Binary and Binary will remain the same. An undefined reserve bit will be used to identify the format as Compact Pseudo-Binary.

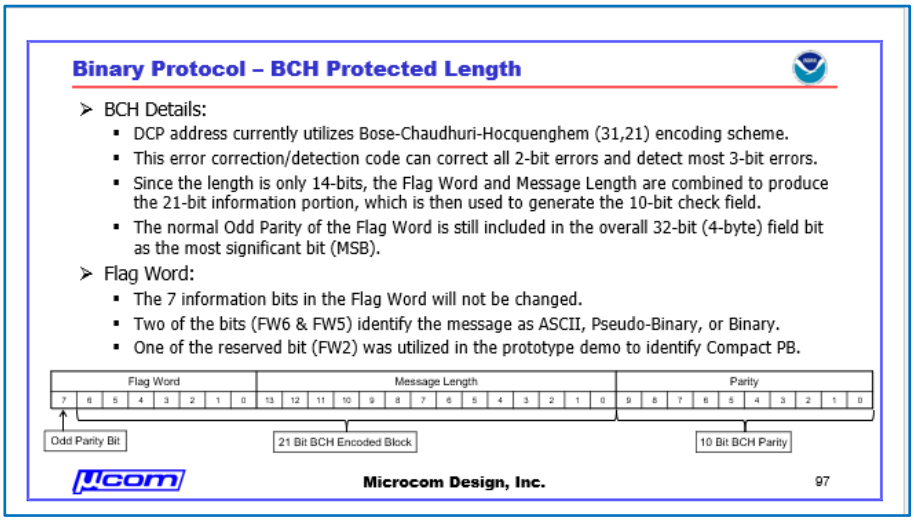


Figure 19: Microcom's Proposed Binary Solution BCH Protected Length

Brett continued with a slide on the proof-of-concept demonstration. Once NOAA accepted the Binary Protocol recommendations for a demonstration, Microcom began implementing the protocol with the DCS Pilot/Test Transmitter (P/T Tx) that drives the pilot uplink at WCDAS and CBU. The pilot can also act as a test transmitter as it can use CS1, CS2 and all variations of the messages. We had to modify the DAMS-NT demodulator and receiver systems to be able to receive the messages. The prototype work was completed in January and were ready for the demonstration by February 2022.

This was a virtual demonstration run from Microcom's office in Hunt Valley, MD. The binary messages were received on Microcom's DAMS-NT/DADDS sustainment rail. The binary messages were also detected by the NOAA sites but were not properly received since the operational DAMS-NT/DADDS systems had not been updated. In addition to sending some legacy ASCII/Pseudo-Binary messages at the beginning part of the demonstration, the primary part of the demonstration consisted of two binary examples.

- A binary fill message that consisted of all 256 8-bit binary values to demonstrate that the implementation would not be confused by key ASCII control codes (e.g., the ASCII EOT character – 0x04).
- A Compacted Pseudo-Binary example using a typical Florida Department of Transportation message to demonstrate how it can be compacted to reduce the message size by ~25% while still conveying the same amount of environmental and system information.

Brett then showed three slides as examples of what was received. They are shown Figures 20-22.

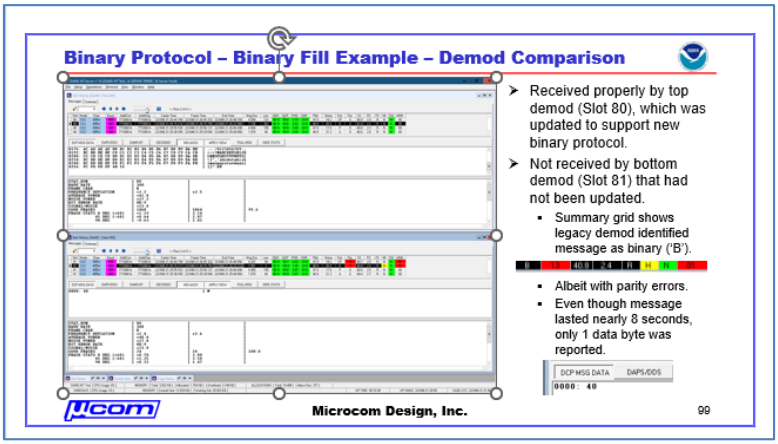


Figure 20 is an example of 2 demodulators. The top half of the example is the one that has been updated and the bottom half example is the one that was not updated.

Figure 20: Binary Protocol Demonstration Binary Fill Example – Updated Demodulator

Figure 21 is an expanded view of the demodulator that received the binary message (the top row in Figure 22).

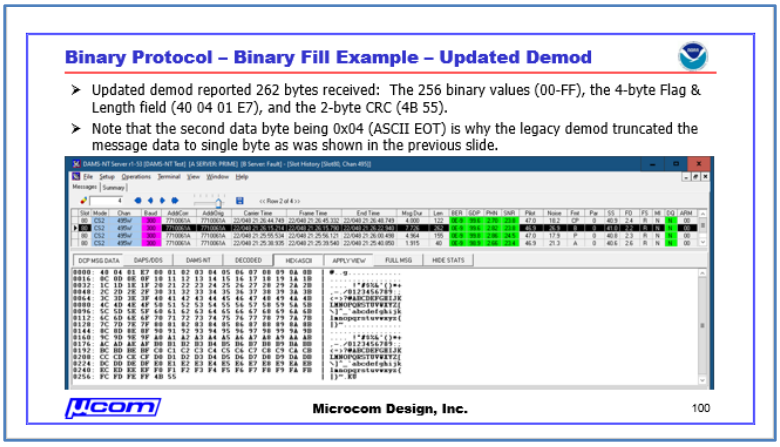


Figure 21: Binary Protocol Demonstration Binary Fill Example – Updated Demodulator

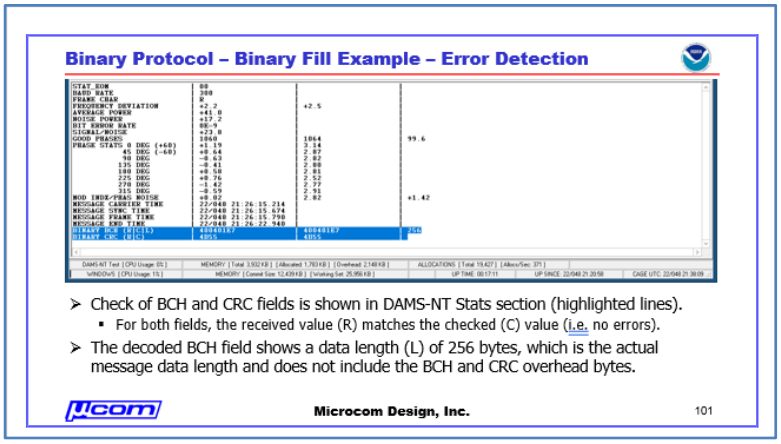


Figure 22: Binary Protocol Demonstration Fill Example – Error Detection

Figure 22 shows that the CRC and BCH fields words agree showing that there were no errors and that the total message length was used. Note that the length is the data length and not the total length as it does not include the BCH and CRC overhead length.

Brett then briefed that once Microcom had proven the capability to send the binary data, they wanted to present a recommendation that Microcom had in their 2005 proposal called Compacted Pseudo-Binary. This method allows users to quickly transition to binary as it takes Pseudo-Binary data, which consists of 6 bits out of every 8 bits in a byte, turning a binary message into ASCII readable characters. If you take the 6 bits out of 4 bytes, you can then convert them into 3 bytes. This gives a 25% reduction. This happens at the transmitter and then can be converted back at the receiver so you can continue to use your same decoding scripts as before. Microcom calls this "IT Transparent." This method is described in Figure 23.

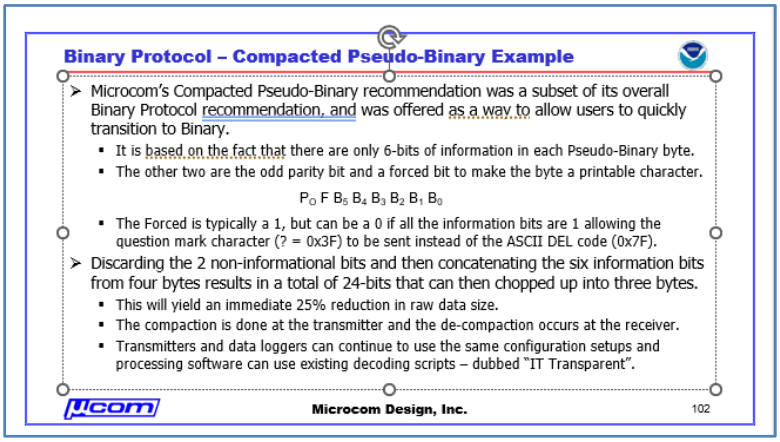


Figure 23: Binary Protocol – Compacted Pseudo-Binary Example

Brett then provided an example of an actual Florida Department of Transportation message. This example is shown in Figure 24 below.

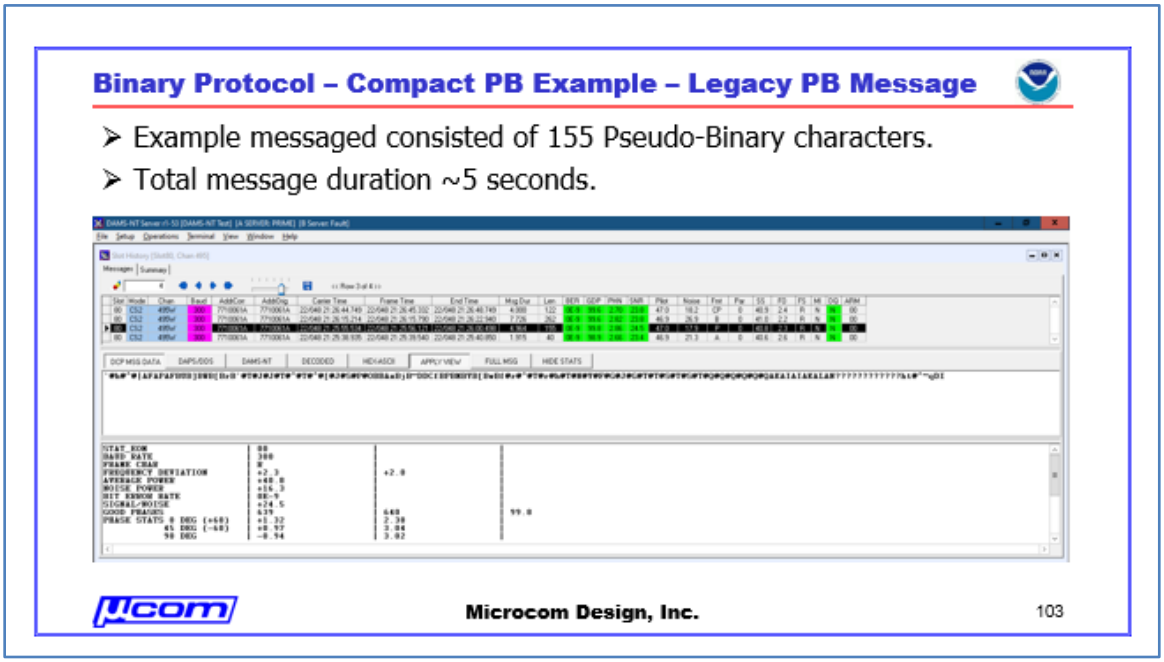


Figure 24: Binary Protocol – Compacted Pseudo-Binary Example – Legacy Pseudo-Binary Message

When we sent it as compacted, it comes back as 122 bytes. There is a message duration of 4 seconds, an overall message length of 20%, an overall raw data reduction of 25%, and an overall byte count reduction of 21%. This is shown in Figure 25.

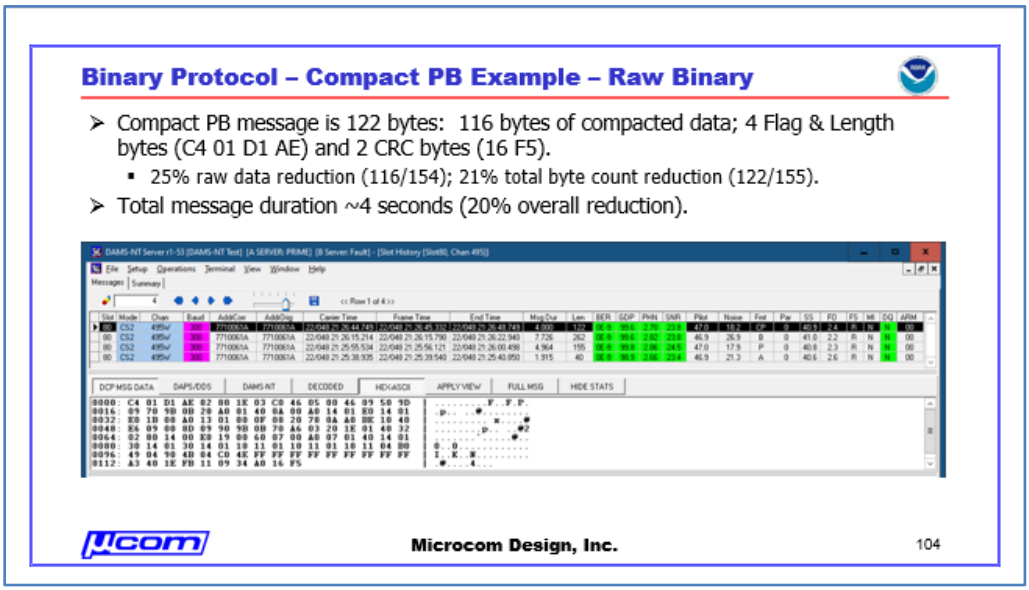


Figure 25: Binary Protocol – Compacted Pseudo-Binary Example – Raw Binary

Figure 26 below shows that that the binary message was de-compacted into Pseudo-Binary and regenerated with the same character sequence so that it can be decoded.

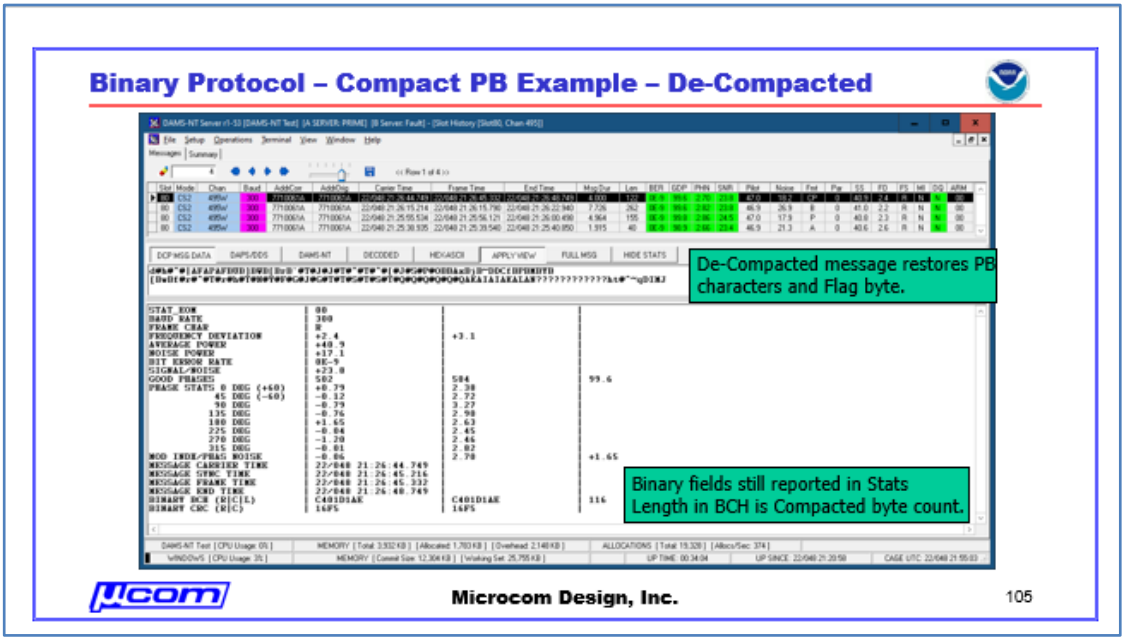


Figure 26: Binary Protocol – Compacted Pseudo-Binary Example – De-Compacted

Brett continued with the key decisions that have to be made to move forward.

Do we want to move forward with Binary Protocol, and do we want to move forward with it as recommended? The Pro is that it will allow users to begin to use Binary DCS messages and will provide system flexibility and security going forward. Users would be able to produce messages in binary any way they wish. Users can add additional error correction capabilities and add encryption for increased security if they choose. Also, this changes the ASCII into binary which alleviates the issue of security teams mistaking ASCII for being a telnet port. The con is that this will require updates to the certification specification. There would have to be a comment and approval process. After approval, manufacturers would have to update their transmitters. The DCS receive systems would also have to be updated. Some initial implementation has been completed as part of the prototype demonstration.

Do we include the Compacted Pseudo-Binary concept? The pro is that it will allow users to transition to binary quickly using existing message coding schemes and decoding scripts, essentially being IT Transparent from that perspective. The con is that it will require additional work updating Certification Specifications, DCS transmitters, and also the DCS receive systems.

Should the compacted ASCII capability be included? A subset of all ASCII characters would be encoded in 4 or 5 bits and compacted. If the DCS community is going to make updates to do the certification specification for the binary and the Pseudo-Binary protocol, now would be the time to include the compacted ASCII as well. A pro of adding this is that it will allow the field technicians to read the ASCII values. A con is that this work was not included in the prototype and requires additional work updating certification specifications, DCS transmitters, and DCS receive systems (initial implementation already done).

Brett Concluded with a summary slide including next steps, which are shown below.

- Summary

    - The idea of binary message data has been around for quite some time.
    - Its use has been held back since a complete Binary Protocol Specification has never been fully defined and adopted by the DCS community.
    - NOAA funded a new study and proof-of-concept prototype to push forward on a proposed Binary Protocol.
        - A preliminary recommendation has been made but needs to be accepted and ratified.
        - A successful Proof-of-Concept has been developed, demonstrated, and reported on.
- Next Steps
    - Decision to move forward.
    - User and manufacturer feedback on protocol recommendations and key decisions.
    - NOAA to fund initial Certification Specification updates that will then be shared with DCS community for questions and comments.
- A minor note is that if the certifications specifications need to be updated for the binary standard, it could be tied in with any changes required by the task to implement automated latitude-longitude.

Questions and Answers:

The Question and Answers for this presentation begins at minute 2:36:37 of the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Question - Jim Conrad: Bordeaux is a shorter version of ASCII. It is from the teletype era. It eliminates some of the bits. It is compatible with ASCII.
Response – Brett Betsill: I will take a look at this. This may allow us to do 16 characters.
Response – Jim Conrad: I think this is 5 bits. This could save some work.

Question – LySanias Broyles: Would this be compression or compaction?
Response – Brett Betsill: Compaction is a form of compression. DCS needs lossless vice a lossy compression technique. Microcom's recommendation is a to use a compression technique. This would be similar to Morse Code, in that there is no specified length. The idea from binary is that there is no specification as to what the data is. The general concept is that you put your data with a specified 4-byte BCH code specifying message length and at the end a 16-bit CRC.

Question – LySanias Broyles: If we were to move something like this, would this cause a problem with the software?
Response – Brett Betsill: The message data came in, was not decoded by WCDAS, and it did not crash the system. It only showed up as an error until updates are completed.

Comment – Skip Dronen: This is a very interesting topic as it has implications for everyone in the DCS system. A question is why these have not been implemented since these concepts have been around? Do they not bring value or was it based on how the DCS system is organized where any change to that system have huge effects across the hemisphere? What is appealing is the reduction in message length and the increase the efficiency of the system which could help uses to send more data. Also, does this represent any power savings on the DCPs. If we can implement these things, the users will be able to make the choice.
Response – Brett Betsill: One of your comments is why has this not been implemented before. The DCS system is unique in that the people who run it, NESDIS, operates it, but NESDIS is not the actual end users of the data. NESDIS provides the data path, but the users need to get the data. If they are getting their data, there is no drive to perfect things and there are many opinions on what is useful. Unless NESDIS takes the initiative to fund a task, it will not happen. NOAA has never taken the initiative.

Comment – Warren Dorsey: For the people who want to use this, the modifications are minimal to the system, and it is transparent to the user. Is this more of a modification to pseudo-binary or is it true binary? There needs to be a transition period and be able to support what is there and add the new capabilities underneath.

Comment - Brett Betsill: True binary definition. You need the true binary to compact pseudo-binary. If NOAA wants to offer a quicker transition to binary, then you would add the Pseudo-Binary and possibly the compacted ASCII. NOAA should do it all or just do the binary standard. The official document for CS2 took 5 years. I would hope this would not take as long, but it is a community decision.

Question - Skip Dronen: If this is implemented and no one uses it, no one would know, so would there be a net negative?
Answer – Brett Betsill: That is correct except the small amount of tax dollars to implement it.

Question – LySanias Broyles: If we went to a binary standard, could we transmit other data like imagery or other types of products using this same mechanism.
Answer – Brett Betsill: You could not transmit video in the number of bits allocated. There have been pictures sent at 128 by 320 but that could be as much as 5000 bytes. If it was worth it to have the image, the user might have to wait a day or so. Random channels are limited even further. So, not video but yes other data. 120x320 or sort of a thumbnail image. That is 5000 bytes. You could get that back in a day.

The presentation slide (s) (BinaryMessage Standard Betsill) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

Automatic Latitude-Longitude, Craig Pulford - Microcom Design

This presentation is best listened to in combination with the slide presentation. The location of the audio/visual and Powerpoint presentation are listed below.

- *This presentation starts at minute 2:58:19 on the audio file "Day1 1455 TWG Meeting-20220510 (vid)".*
- *The presentation slide (s) (Automatic Lat-Long Pulford) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html*

Craig Pulford began by commenting on the Platform Description Tables (PDT). A PDT defines a DCS platform. A record is created in the PDT Table in DADDS. The record contains the following information.

- A PDT (Platform Definition Table) is maintained in DADDS for all platform assignments
- The PDT includes over 50 fields to fully define each platform
- NOAA authorizes platform assignments for each user platform by defining:
    - DCP address
    - Prime and Secondary Channel and Type
    - Time assignment (first transmit, transmit period, window, transmit window)
    - Data Rate and Format (100/300/1200) / (ACSII, BINARY, PSEUDO-BINARY)
- After deployment, the user is expected to define items like:
    - Location of the platform
        - Friendly Name or Location
        - Latitude / Longitude
        - Country / State / Province
    - Transmitter manufacturer / model

- Platform Owner Name and Contact Information

The issue is the management of the PDTs. If there are 42,000 platforms, the issue of completeness and accuracy becomes apparent. DADDS has the capability to send informational messages. Examples are when a platform is out of its window. There used to be one that flagged that a PDT is incomplete. One of the low-hanging fruits that can be captured are information that the platforms know about. An initial solution was proposed and accepted by NOAA and to do a proof of concept to automatically improve the PDT database. The proposal is called the Tx ID.

- A DCP shall be demonstrated to Transmit (Tx) a new Identification Message (ID) upon initial deployment and possibly at random intervals; examples could be biweekly or monthly.
- This Tx ID message shall transmit static and measured platform and transmitter information that can be used to update the PDT.
- Tx ID Messages can be automatically processed by DADDS and utilized to update the following.
  - Populate or update key fields in the DADDS Platform Database Table (PDT), such as latitude, longitude, transmitter manufacturer type.
  - Optionally, Country and State/Province fields could be calculated and updated from the received latitude-longitude.
  - Additionally, key configuration parameters such as the time window information which could also be compared to NOAA assigned values in the PDT database, but not corrected.

In DADDS, NOAA fills out some of the data. That data cannot be changed by the general user. The fields that a user can change are the platform details. This is shown in Figure 27.

- Fields in red are the fields that are known by the transmitter and can be sent.
- Fields that could be calculated in DADDS are shown in yellow.
- Fields that can be verified by the database are highlighted in green.

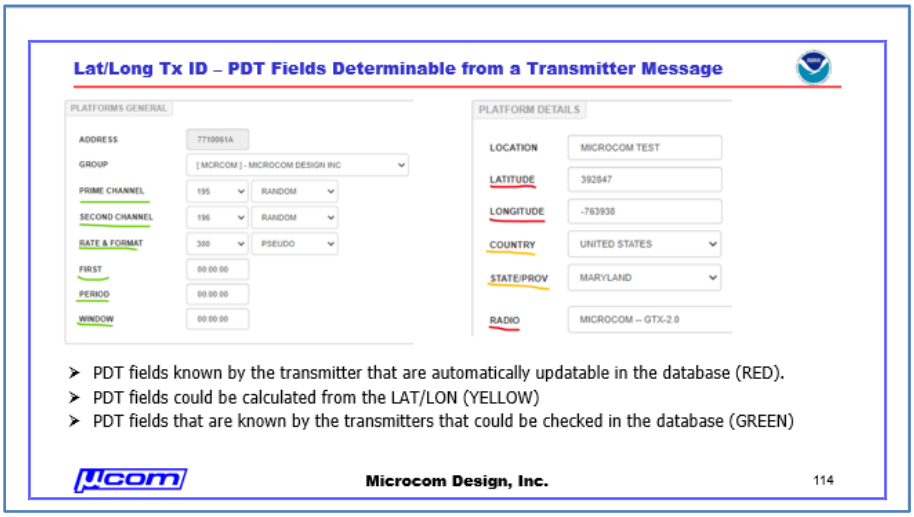


Figure 27: PDT Fields Analysis

It is possible that when a platform is deployed the only thing that would need to be entered is the friendly name.

NOAA has authorized a proof of concept. Microcom would have to perform the following to demonstrate the proof of concept. This would not require a change to the platforms but would be an option.

- Define the first cut of a DCP Tx ID Message structure.
- Make the necessary changes to DADDS to process received Tx ID Messages.
- Make the necessary changes to have DADDS populate/update key fields.
- Utilize Microcom's GTX-2.0 or the NOAA Test Transmitter to demonstrate the concept.

Craig then went over a slide showing the proposed message format. It is shown in Figure 28. The proposed format is 64-byte ASCII that encompasses the fields Craig has briefed. The items in yellow are fields that are not in the database. One example of usefulness to manufacturers and users is if the platform could transmit its serial number and firmware version. This would be useful in keeping track of the platforms in the field. Another example of information that could be updated are the secondary channel baud rate and data format. The message would also end with a CRC figure.

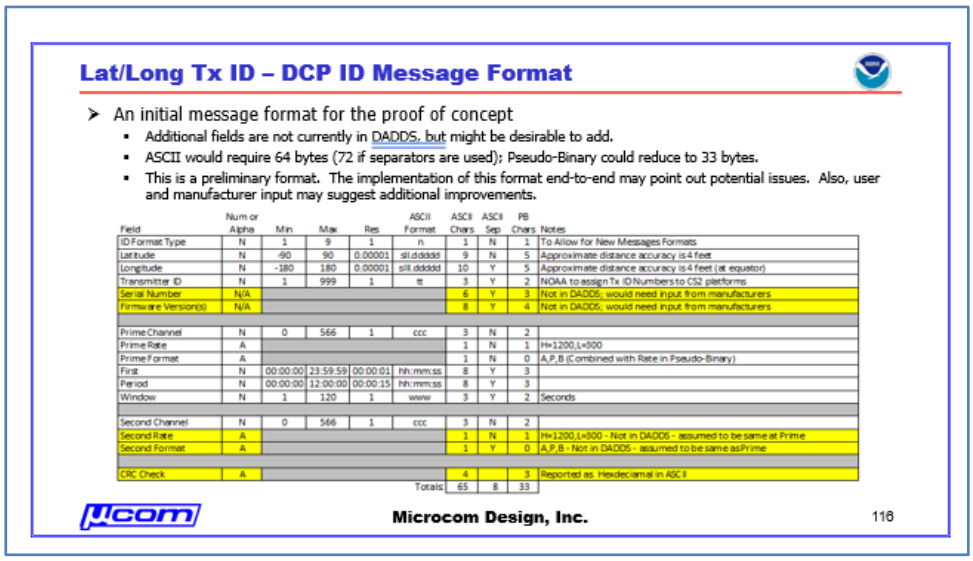


Figure 28: Proposed Automatic Latitude-Longitude Message Format

Craig also briefed some constraints. They are outlined below.

- Cannot use a self-timed approach, must be random messages. We want to transmit the message when it turns on. These transmissions will be infrequent.
- Random Message Limitations …
    - 300 bps: 3 second maximum message, which equates to just under 80 bytes.
    - 1200 bps: 1.5 second max message, which equates to 175 bytes.
    - Presently there are no 1200 bps random channels.
- A discussion was held on whether this should be a dedicated channel just for these messages or use its own random channel for Tx ID.
    - DADDS shall process any Tx ID formatted message and act appropriately. In the initial implementation of this feature, a platform shall transmit on its defined random channel.
    - For a final implementation, a special channel could be defined for the transmission of these messages. If implemented, this channel would either be configurable or hard-coded in a DCP.
- It is anticipated that manufacturers will update transmitters to support Tx ID features with a firmware update.

Craig then spoke about the DCP. The recommendations are below.

- Use ASCII for the prototype and possibly in long term.
    - Proposed message structure is small enough to fit in existing 300 bps random length.
    - ASCII would make reports human readable and therefore easy to manually check.
    - Switching to Pseudo-Binary would not be too difficult in the future; could also use mix of ASCII and Pseudo-Binary as the NOAA Ocean Service (NOS) does (if needed).
    - If a switch is made to Pseudo-Binary in future, DADDS could show decoded message on the website in place of or in addition to the raw message.
        - Have to decode data anyway to populate/check the fields.
- There may be a need to use Decimal Degrees to five decimal places for latitude and longitude.
    - Not current format for DADDS but can be readily converted.

    - A future DADDS enhancement could make use of higher precision.
- Include 4 additional fields in the demonstration, but do not process them in DADDS.
    - i.e., Do not add additional database fields, at this time.

Craig then went over the technical points for processing which are listed below.

- DADDS shall compare all received messages to the Tx ID Message format.
- A Tx ID Message shall be valid only if the CRC is verified and all fields range check to allowable values.
- If a received Platform Address for a validated message is found in the PDT, update:
    - Latitude
    - Longitude
    - Transmitter Identifier
- Future: From the Latitude and Longitude determine and update:
    - Country
    - State/Province
- Future: Verify and email DCP owner regarding any configuration issues for:
    - Transmit channel(s) / Transmit window / Baud rates

Craig continued with proposed modifications to the transmitter. They are detailed below. It needs to be decided whether this should be optional or required.

- The required changes to implement Tx ID for any manufacturer's DCP are probably similar.
- When enabled for operation, enable the GPS receiver to acquire Date / Time / Latitude / Longitude.
- The Tx ID Message should be transmitted at first power-on of a platform's defined random channel using the same algorithm as a standard random transmission and complying with the GOES Data Collection Platform Radio Set (DCPRS) Certification Standard.
- It is recommended that the Tx ID Message be transmitted randomly thereafter every (15) days. (This feature and interval to be defined by NOAA)

There are also some additional long-term considerations that came from user input.

- Is including the transmitter Serial Number and Firmware version worthwhile?
    - This certainly could have been useful during GPS WNRO updates.
- Is the Second Rate and Format needed?
    - Can envision Self-Timed using one rate/format and Random using something different.
    - This is for completeness of how a platform is configured
- Would adding Altitude from GPS receiver be of value?
- Would repeating ID Messages on some period basis (e.g., monthly) be useful?
- Would allowing Manufacturer Specific data after CRC Check be a good idea?
    - This would allow for a manufacturer receiving data on its systems.
    - Would obviously require longer permissible transmission times if ASCII is utilized.
    - DADDS would ignore the additional data.

Craig concluded with a summary and a description of the next steps.

- Summary
    - The Tx ID proof of concept shall be demonstratable to NOAA by the end of May 2022.
    - Implementing the features of a Tx ID Message will improve the accuracy of the PDT database.
    - ASCII could be utilized long-term, but not much room for expansion with 300 bps and current certification limits.
- Next Steps

- Bring DADDS processing online. As a start, only on one of the NSOF processing rails.
  - This would allow users to test the system
- Allow manufacturers and users to implement the current approach in their DCPs.
- Allow a time period for comments and implementation of final features.
- Publish a final specification and an implementation date.
- Update to DCP Certification Standard 2 (CS2) and develop a timeline for system wide implementation.

Questions and Answers:

The Question and Answers for this presentation begins at minute 3:22:08 of the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Question – Skip Dronen: If, for example, 33,000 DCPs all get updated with CS2, latitude-longitude and binary in 2026 and are all fighting for random channels along with DCPs that use random channels, is it going to be a management issue to ensure what additional load would go on the random channels?
Answer – Brett Betsill: It was always thought we would do a study before we set things up especially if we were going to repeat the transmissions. We did some additional testing. DCPs are not deployed every day, so the loading is minimum.

Comment - Nathan Holcomb - I would have concerns if this was mandated as the first message sent by the transmitter at start up. We regularly have power issues as the station may only power up briefly and then transmit a message. I would prefer that message to have environmental data instead of a status message.
Response – Brett Betsill: That is a good point. This is why we present these things and put them out for comment. We could delay these messages for some time until the battery charges.

Comment - LySanias Broyles: In a GIS perspective, it would be great to be able to geo-locate the platforms, in near real time, without guesswork.

The presentation slide (s) (Automatic Lat-Long Pulford) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

Automated PDT Batch Updating: Matt Ceanfaglione - Microcom Design

This presentation is best listened to in combination with the slide presentation. The location of the audio/visual and Powerpoint presentation are listed below.

- *This presentation starts at minute 3:31:16 on the audio file "Day1 1455 TWG Meeting-20220510 (vid)".*
- *The presentation slide (s) (Automated Batch Update Ceanfaglione) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html*

Matt Ceanfaglione began his presentation by stating that he is reviewing the automated batch submission test that has been ongoing for the past few months. The automated batch system modification has been a desire of DCS users for some time. Larger users must do manual uploads to DADDS which is tedious. They also maintain separate databases which requires multiple updates for each update. This feature provides a way for standard batch files to be submitted to DADDS for processing, without human interaction. It is intended to be a machine-to-machine interface, but users will be able to manually upload files as well.

This was implemented within DADDS about seven years ago. We have been held up due to IT security concerns. We have to transition the secure protocol to SFTP from FTPS. The SFTP server listens for client connections, performs authentication and stores uploaded file in a directory for further processing. From there, existing batch processing functionality processes the uploaded files and performs database updates.

The SFTP interface relies on private/public keys to authenticate computers being used to perform transfers. Management and registering to use the feature can't be automated. The keys must be exchanged between NOAA management and the user before they can connect and upload. DCS management will be responsible for handling the exchange and directing installation of the keys. But, once configured, it will only need to be reconfigured if the computer being used changes. We did add some web-based management tools to allow the registration of an automated batch user role, which would be assigned to users for identification. Final authentication will be performed using public-private key cryptography. The exchange with DCS managers will occur directly via email and secure transfer services for the time being. This means that user connections must use an SFTP client application that is either controlled automatically or manually by the user. Any client that complies with the SFTP protocol can be used. There are several free or for purchase third party applications available. No client has been mandated to retain flexibility for users who have different systems and needs. Microcom is using an application called "MoveIT" which is a freeware application for test package.

The core SFTP component is not involved in actual automation, thus can be used manually if desired. There are several technologies available that can control the automation.

- Linux Cron Job
- Windows Scheduled Task
- 3rd Party Software options that can be used.

The basic automated setup in Windows consists of a MS-DOS transfer script executed via a scheduled task. In Linux this will be a batch transfer script executed via a Cron job. In other applications, it will be a script execution and scheduling via 3rd party or custom application. Further testing will require some user participation. Please contact Letecia or Matt if you would like to participate. It does not matter the size of the user. Some users have already responded.

Questions and Answers:

The Question and Answers for this presentation begins at minute 3:40:02 of the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Question – Skip Dronen: From the perspective of a user that does not need this function, will this be something they need to implement in the future?
Answer - Matt Ceanfaglione: No. This is mainly targeted to larger users. No mandatory use.

Question - Skip Dronen: In terms of using third party software, will there be another job aid, guide or training?
Answer - Matt Ceanfaglione: For testing, Microcom has provided a client package containing the application, sample scripts and everything needed to test. They can use their own tools for operations.

Question – Warren Dorsey: Is there any custom code needed?
Answer - Matt Ceanfaglione: The actual transfer script tells the SFTP client what to upload so that is somewhat custom code. The package has an example of the script.

Question – LySanias Broyles: Can you use the same key pair across several systems?
Answer - Matt Ceanfaglione: Yes. Whatever system you use can use the same key. It is not particular to a system

unless that is what you choose to do.

Question – LySanias Broyles: What is the most secure software to use?
Matt Ceanfaglione: That is configurable. The package that we use is up to date. Eventually, we will get a secure option that is approved by the DCS IT Security Team.

Question – Warren Dorsey: Will there be something posted on the website on how to do this.
Answer - Matt Ceanfaglione: Yes. I imagine we will want this in place. An initial method is in his current testing documentation.

Question – Warren Dorsey: Do we have a timeline for completion?
Answer - Matt Ceanfaglione: There is no definite timeline. Everything will be complete by the end of June. We will contact defined users this week. He will talk to Mark Hall from WCDAS about putting things on the web site.

The presentation slide (s) (Automated Batch Update Ceanfaglione) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

New Action Item Review - Close: William "Skip" Dronen
NOAA/NESDIS/OSPO/SPSD/ Direct Services Branch

This presentation starts at minute 3:47:49 on the audio file "Day1 1455 TWG Meeting-20220510 (vid)".

Skip Dronen noted that there is a theme related to the binary protocol, latitude-longitude, and batch updating discussions that user input and engagement is important. If you would like to be added to future open discussions on either of those topics, send me an email and I will add you to the email list.

Day 2 - Session 1: December 11th, 2022:

Welcome and Logistics: William "Skip" Dronen
NOAA/NESDIS/OSPO/SPSD/ Direct Services Branch

This presentation starts at minute 0:00:45 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Skip Dronen opened the second day of the meeting at 11:00 EST. On day one of the meeting, NOAA reported on three initiatives (Microcom). They were the binary protocol, automated latitude-longitude reporting and DADDS DCP batch updating. If you would like to go on a contact list for all or any of these projects, please contact Skip Dronen or Letecia Reeves. User participation is the "solid gold" for these meetings. Please do not hesitate to ask questions as it may help you and me. All presentations will be put on the NOAA website (NOAASIS) within a few days after the meeting.

The presentation slide (s) (TWG Agenda Day 2) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

Spectrum Sharing: Dave Lubar - Aerospace Corporation

This presentation starts at minute 0:04:13 on the audio file "2022 Spring TWG Meeting-2 0220511 1500-1".

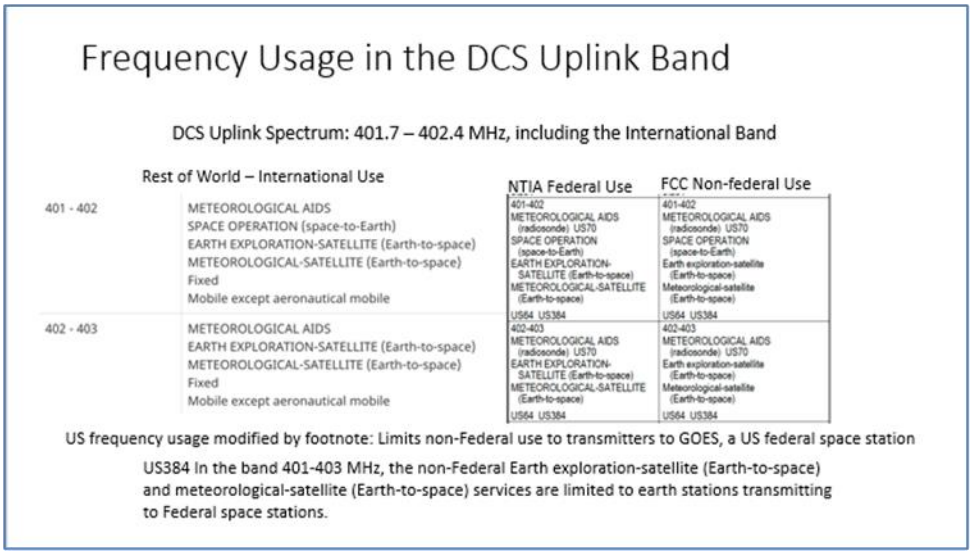


Figure 29: Frequency Usage in the DCS Uplink Band

Dave Lubar began his presentation by going over the frequency use covering DCS in the uplink band. In Figure 29, it can be seen that the international table is on the left and on the right are the U.S. or NTIA tables for both federal and non-federal use. If the text is in all capitals, it is a primary use. Thus, space operations for earth exploration and meteorological satellite are primary for uplink in this band. The footnote number 384 states that uplinks are limited to earth stations transmitting to federal space stations. Since the only space stations licensed here are GOES and GOES-R, the uplinks are limited to DCPs. However, in the international world, this footnote does not exist.
It is useful to know when DCP channel is missing signals, as we can troubleshoot the issue if we suspect that interference is the cause. It would be great to have a restrictive footnote in the other countries.

Dave then went over the DCS downlink frequencies between 1697.7 MHz and 1680.4 MHz. The lower two-thirds of that band are used for the DCPR signal in the Americas. Since the GOES DCS transponders are a relay, interference in the uplink will be seen in the downlink. An interfering signal in the downlink will affect the reception of the data. One of the companies in this area is Ligado. Ligado desired to use frequency for 4G/5G. They needed two uplink and two downlink channels with each being 10 MHz wide. The original controversy with this plan was that the second downlink was near the GPS signals and was going to cause interference in the ground receivers. In Figure 30, this can be seen in the brown box with a black X inside it.

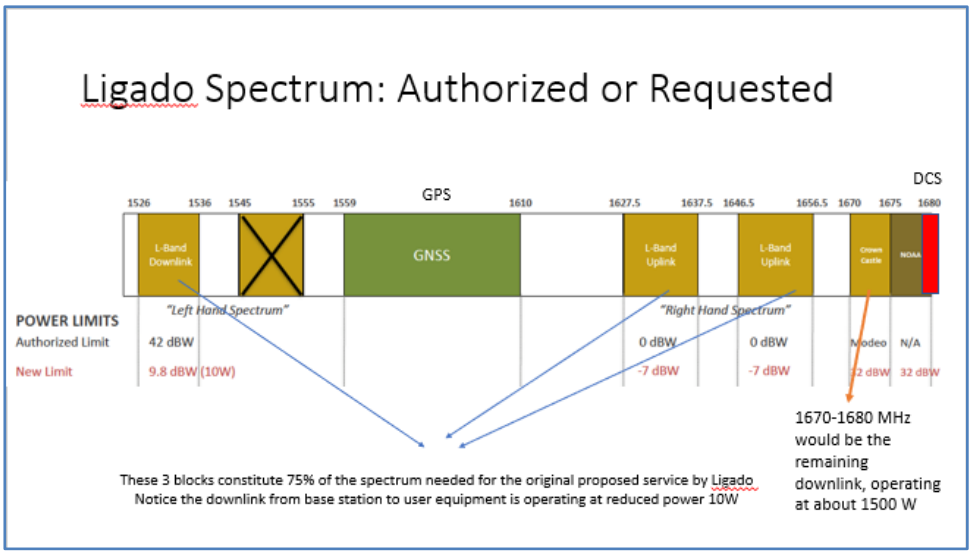


Figure 30: Ligado Spectrum: Authorized or Requested

Two years ago, the three brown boxes, shown in Figure 30 with blue arrows extending downward, represented the "other 30 percent" that they needed. Later they requested to share 5 MHz of the 1670 – 1675 band with NOAA. Unfortunately, their signals will be a lot stronger. This would cause interference within the DCS frequency band, and you would not be able to filter it out. There is a congressionally-mandated study that was undertaken by the National Academies of Science on GPS impacts. It appears to have not been published yet. Several federal agencies and the federal regulator (NTIA) petitioned the FCC to review that order and stay the use. The FCC has taken no action on those requests, nor have they taken any action on Ligado's request to share the 1675-1680 MHz band, nor has there been any indication of when they may do so. The FCC approved the use of the 1526–1536 MHz band two years ago, and Ligado is suggesting that it may begin some operations in 1526-1536 MHz on or after September in some areas

In the 1710 MHz band above GOES, Dish Network is working on a rollout of an open standard 5G service. They have already turned it on in Las Vegas, NV. They must cover 25 percent of the U.S. population according to their license. Dish Network intends to rollout in 25 major markets and 100 smaller cities before the June 2022 deadline. These are links to more information.
Details: https://www.fiercewireless.com/5g/dish-marks-5g-progress-plans-launch-5g-25-major-markets-june#:~:text=Dish%20promises%205G%20launch%20in%2025%20major%20markets%20before%20June%20deadline,-By%20Bevin%20Fletcher&text=Dish%20Wireless%20is%20gearing%20up,of%20its%20June%20buildout%20deadline.

Questions and Answers:

The Question and Answers for this presentation begins at minute 0:21:03 of the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Question – Warren Dorsey: Is it possible that the 1695 MHz part could interfere with HRIT?
Answer – Dave Lubar: Yes, it is possible.

Question – Skip Dronen: Very high-level question; what is the process that commercial companies go through? Does the government have an opportunity to have input?
Answer – Dave Lubar: There is a process whereby commercial users, managed by the FCC, need a spectrum source of new bands, especially for 5G. The NTIA and other federal committees suggest bands and sometimes there are bands that get written into legislation. The FCC then has a public notice of rule-making and takes input. Federal users put input through their representative at the National Telecommunications Information Administration (NTIA). The NTIA can comment to the FCC. International users can provide input directly to the FCC.

Question – LySanias Broyles: Does the FCC inaction mean anything? Can you gage their sentiment from inaction? Since the FCC has not done anything does that mean that Ligado cannot move forward?
Answer – Dave Lubar: Ligado petitioned the FCC for the band. The FCC is an independent arm chartered by congress. They are not part of the executive branch. The FCC generally has five commissioners. Three of them are from majority party and two of are from the minority party. They are missing one majority commissioner. Thus, there are two republicans and two democrats. That may be contributing to the delays on action. We have talked over the years about the SPRES study and report that NOAA commissioned that were supposed to indicate whether the band could be shared. NOAA has sent it to NTIA, but it has not been published yet. That report would go to a technical panel; one member from the FCC, one from NTIA and one from OMB. They may be waiting for the report.

Question – LySanias Broyles: So, does that mean that it is not likely to act prior to the report being issued?
Answer – Dave Lubar: Yes, but we do cannot predict what they will do.

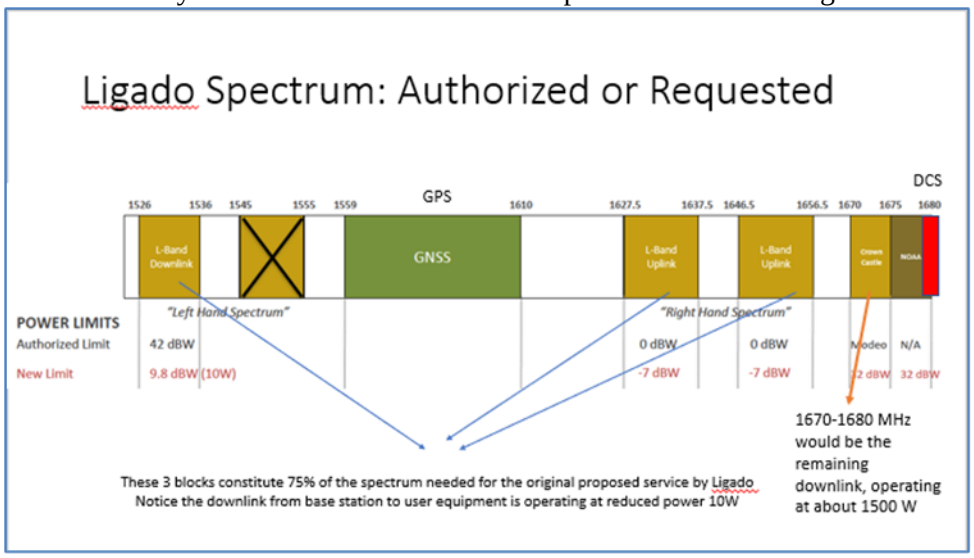
Question – Warren Dorsey: We were supposed to have HRIT and DRGS protected sites. Will this be part of the considerations? Is the RFIMs part of the consideration?
Answer – Dave Lubar: I do not have any new information on RFIMS. It was originally intended to protect the 1695 – 1710 but could be tuned down. Determining the sources of interference does not do much good if the interferer has a license and is within your band.

Question – Warren Dorsey: Having the DRGS or HRIT site identified should do some good.
Answer – Dave Lubar: There were footnotes created with a limited number of protected federal sites.

Comment – Brett Betsill: Part of the issue with the protection is that the original protection came from the AWS-3 auction that sold off 1695 – 1710. At that time, the DCS was at the top of the band. This was before GOES-R deployment. The protection zones are now called coordination zones. They can use the frequencies near the GOES downlink but they need to coordinate and put together a plan since DCS is the primary users. However, this is more of an issue for HRIT since it was moved to the top to replace DCS. None of the HRIT sites were put on the coordination site list. At this time, they should be trying to protect HRIT at 1695 – 1710 MHz and DCS at 1675-1680 MHz. Going back to the question of whether HRIT could be impacted by Ligado, the number one thing that Ligado can affect is the DCS as it is in band to the DRGS downlink. Microcom has been to up to 20 sites and every site, including where the RFIMS receiver are, is seeing a Ligado tower transmitting at 1670 – 1675. They are transmitting low power, but it is swamping the DRGS downlink. If they are close, there is nothing that can be done. The next bigger concern is the GOES-R is GRB. HRIT could be somewhat protected from Ligado. Users should be able to filter it out if the power remains low. However, if they increase power, they will

probably wipe out the HRIT as well.

Comment – Dave Lubar: Referencing Figure 30, where the text is colored, and following the text "new limits," it shows that they have a limit of 10 watts as that power level was changed due to being told the power levels were too high. Thus, in the 1526-1536 band, they can only transmit at that limit. Thus, at that low limit, Ligado would have to put out more towers to service the same number of users.



Within the shared frequency with NOAA at 1675-1680, they are proposing to use 1500 or so watts. It is likely that they will use this higher power frequency. If they use this for tower transmission it is going to impact users. They are also leasing 1670-1675 and are authorized the same level of power as they have requested for 1675-1680. They are currently not using that level of power. Brett commented that if they increase to full power, they will overwhelm the front ends of DRGS receivers.

Comment - Brett Betsill: It seems like they are broadcasting at 1-10 watts. Microcom sees it coming in at equal strength to the DCS downlink or sometimes 10-15 DB stronger. This is ok now as it is not enough to overload the front end. It is too close to be filtered out with the current front ends. Users could filter out the 1670-1675 a little more but whether you could filter out enough is questionable. If they started transmitting in 1675-1680, there is nothing you can do because it is in band, and it cannot be filtered. This has been observed in many DRGS sites. The towers are there and transmitting and if they crank the power, it will bring them all down.

Question – Warren Dorsey: If they do increase the power, can we be certain that our stations at WCDAS and CBU are not going to be overloaded too. If they are overloaded there will not be a lot of data.
Answer – Dave Lubar: There were a limited number of federal sites that were listed and that included WCDAS and CBU. They are not exclusion zones (they are coordination zones) but is says they shall not cause interference. If the zones are big enough and you keep them away far away enough, you have that mitigation. Dave Lubar thinks it is footnote 80.

Comment – Warren Dorsey: Due to atmospheric ducting, WCDAS can receive interference from long distances away like Richmond, Norfolk, Baltimore, and other different places.

Question – Paul Seymour: GEONETCast is in C-band. C-band and Ku-band would be candidates for a commercial broadcast for GeoXO in the future.
Answer – Dave Lubar: Those are already commercial satellite bands. The C-band was 3.7 – 4.2 GHz. The bottom 2/3s were repurposed for 5G. A lot of the transponders were redesigned using frequencies above 4 GHz. There is a guard band. The channels used to relay the NWS AWIPS data were already above 4 GHZ so they were not

impacted. All three or four of the main commercial satellite companies issued plans, reshuffled transponders, if need be repointed antennas, and added filters to keep those lower frequencies out. This should be a mature process now. This was an effort over CONUS only. It did not even disrupt Alaska. Ka are narrower beams and are commercial satellite channels. We need to keep our eyes on this to see if they try to share.

The presentation slide (s) (Spectrum Management Lubar) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

USGS Depot Update: Laura Flight - U.S. Geological Survey/Water Resources Mission

This presentation starts at minute 1:14:37 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Laura Flight began by noting that she briefed the STIWG on the USGS Config Depot in December. There was then a feedback period of approximately six weeks. We made changes based on the feedback we received.

The priority feedback issues were the following.

1. Changed the state to be a "pick list." Typing in the states produced results were not always as desired. The pick list also includes some Canadians Provinces and U.S. territories as well. Whatever the geographic unit containing a USGS station number is included.
2. A lot of people use the configuration depot by changing the site number in the URL itself. We were unaware of this use case until we received the feedback. We have now implemented that functionality.

Laura then gave a demonstration with the new link but with a stale database as it is not in production mode yet.

The USGS Configuration Depot demonstration begins at hour/minute 1:16:28 of the audio file ("2022 Spring TWG Meeting-20220511 1500-1") and on slide number 3 of the presentation slides titled "USGS Config Depot Flight" that can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html.

Laura noted that the final rollout will be in the July-August timeframe. She noted that she will keep in contact as the time nears. The tip sheet and crosswalk document have been made available and will be promulgated again to assist with the transition. The rollout will be done over a period of a few hours for the entire database. This will be true for DECAPS as well.

Questions and Answers:

The Question and Answers for this presentation begins at hour/minute 1:24:40 of the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Question - Arthur Armour (from Chat): Is there a URL that allows us to use the last week or 30 days or other period such that we would get a list of stations that have been updated recently?
Answer – Laura Flight: At the present time, this functionality does not exist.

Question – LySanias Broyles: Why did we get two stations back from the search using the station ID.
Answer – Laura Flight: They are two different platform channels. One is for self-timed and one for random. There could be two different configurations. There is one physical platform in the field.

Question – LySanias Broyles: Can you automate retrievals? What would it take to include this?
Laura: This would be a challenge. The challenge is making an internal database accessible to the Public. It would be quite difficult to make the API available to the public.

Question – LySanias Broyles: What would it take to be able to be able to filter by modified data?
Answer – Laura Flight: That might be easier to do but still would have to go through a process.

Question – Skip Dronen: Is this completely internal to USGS? Can other people obtain data?
Answer – Laura Flight: There is a public URL for the Configuration Depot. This is accessible to anyone in the public. The DECAP application, which is replacing DECODES, is internal to USGS only.

Question – Skip Dronen: Does this contain configurations from anyone other than USGS.
Answer – Laura Flight: No, this is just for USGS sites.

The presentation slide (s) (USGS Config Depot Flight) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

DADDS Configuration Repository: William "Skip" Dronen –
NOAA/NESDIS/OSPO/SPSD/ Direct Services Branch

This presentation starts at hour/minute 1:34:36 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Skip Dronen introduced the discussion by noting it is open for a group discussion for everyone. Is there a desire or need for a configuration repository on DADDS? This, considering the other three projects briefed yesterday. We need to prioritize them. The more user feedback we receive that identifies the priority of this helps solidify whether we formally engage this or not.

Comment – LySanias Broyles: This is important to users that do not own DCPs but need access to the data. A good example is the NOAA NWS HADS program. This ties in with the automated latitude/longitude project. Could we possibly pull in data from the USGS site and include it in the DADDS repository? This would resolve many issues for non-DCP owner users.

Comment - Mike Maloney: One of the issues is the format of the data. DECODES uses an xml format that has been around for a long time. The week before last we demonstrated a new API for the DECODES database. We need some translators for the different ways of doing metadata. I am not sure that a NOAA repository would have to the fine-tooth representation of the data but a representation of what the format is.

Question – LySanias Broyles: Is it possible to get the schema for the USGS database? Even if there is a translator, it might help us when developing our own repository.
Answer – Laura Flight: I think we could make it available.

Question – Skip Dronen: In terms of development, production, and sustainment, what resources did USGS have to put on this project?
Answer – Laura Flight: There is a team of about 2-3 software developers working full time. This has been over a million-dollar effort.

There were no presentation slides for this discussion.

Day 2 - Session 2: December 11th, 2022:

GEONETCAST and DCS Data: Seth Clevenstine - NOAA/NESDIS/OSPO/SPSD/ Direct Services Branch

This presentation starts at hour/minute 3:00:31 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Seth Clevenstine began his presentation by reviewing the testing carried out over the past two months. The goal was to compare DCS over GEONETCast Americas (GNC-A) with DCS over HRIT/EMWIN. The main points are copied below.

- NESDIS has tested DCS data several times over the GEONETCast Americas broadcast during the past two months
  - Only NOAA was able to receive the data during test.
  - GNC-A was provided a copy of the same data that HRIT/EMWIN receives from PDA.
  - NOAA verified that HRIT/EMWIN's "fast track" ability within PDA remained in place and separate from PDA data.
  - NOAA verified the increased message traffic at the teleport ground site was not impacted by a 25% increase in traffic (not data).
  - NESDIS plans to start disseminating DCS data over GNC-A starting on June 1st, 2022.
  - This is a secondary DCS source of data for users as the primary DCS recommended sources are still DRGS and HRIT/EMWIN for highly reliable data retrieval.
  - Data will be available on the "GOES-R-DCS" labeled channel and given a high priority of broadcast distribution.
    - 8KB sized .dcs files with the same frequency of distribution and format provided to PDA are sent and the format is unchanged over the broadcast.

Seth continued by showing the DCS data collection system with GNC-A included. This is shown in Figure 31. This is essentially the same path as the HRIT/EMWIN broadcast except that now the data is sent from the NOAA Product Distribution and Access (PDA) to the Intelsat Commercial Teleport at Ellenwood, GA.

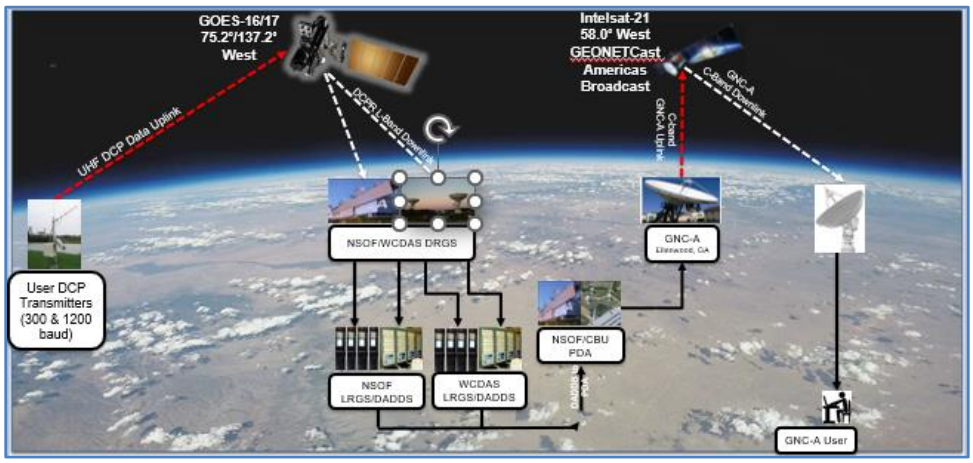


Figure 31: GOES DCS to GNC-A Architecture

A 24-hour test for latency showed that there was no substantial difference between the latency for transmission via HRIT and GNC-A. The overall DADDS to user latency was approximately 6 seconds. This does not include the aggregation of files in DADDS prior to dissemination.

Seth briefed that GNC-A incorporates a subset of all NESDIS distribution systems including GRB, HRIT/EMWIN, JPSS and now, for the first time, DCS. He noted that GNC-A is a regional broadcast in the Global GEONETCast System and that there are approximately 100 users mainly in Central America, South America and the Caribbean Sea. Seth then showed a graphic, Figure 32, that contains the GNC-A broadcast characteristics. He noted that the broadcast was moved up to the upper part of the C-band as part of the frequency re-allocation plan.

GEONETCast Americas Broadcast Parameter	Parameter Value
Satellite	IS-21 (Intelsat)
Location	58 ° West or 302° East
PID	4201
Transponder	19C (DVB-S2)
Radio Frequency Band	C-band
Frequency	4080 MHz
Frequency Range	3700 – 4200 MHz
Symbol Rate:	30.00 Msym
Polarization	Linear – Vertical
Effective Isotropic Radiated Power Coverage	> 31.3 dBW
Datacasting Client Software (Required)	Kencast FAZZT Professional Client
Forward Error Correction – Kencast FAZZT	5/6
Peak G/T (antenna gain-to-noise-temperature)	Up to 2.5 dB/K

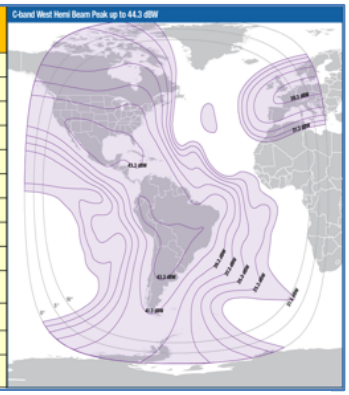


Figure 32: GNC-A Broadcast Downlink Specifications

Seth briefed a graphic of the GNC-A system architecture. This is Figure 33. He noted that it is similar to the HRIT/EMWIN architecture except that NESDIS PDA is only one of several data providers. He noted that there are different aspects related to GNC-A compared to other NOAA systems. These are summarized below. One point is that GNC-A has a larger footprint than NOAAPORT. These points are listed below.

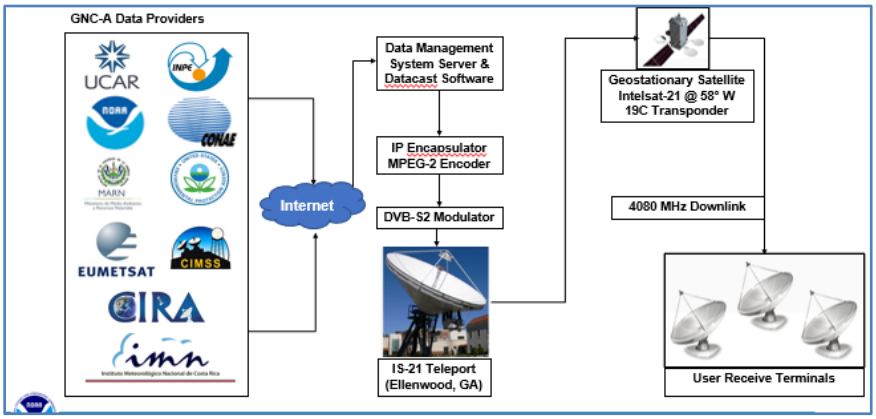


Figure 33: GNC-A System Architecture

- The broadcast bandwidth is scalable, allowing for more products if needed.
- GNC-A's area coverage is much larger than NOAAPORT's North American C-band beam coverage. This gives more international users the ability to capture DCS data and other data.
- A portion of the GNC-A community is also DCS data users.
- C-band receive hardware is more readily available and less expensive than L-band.
- Both China's CMACast and European/EUMETSAT's EUMETCast contain DCS data from their regions.

Seth briefed the hardware needed to receive the GNC-A broadcast. The major hardware pieces are listed below.

- Antenna: 1.8–2.4 meters, depending on location
- Low Noise Block Down (LNB) device
- DVB-S2 compatible receiver
- Kencast FAZZT software
- Workstation for receiving and processing the data

The Kencast Fazzt software is used in the uplink thus user must purchase and install the FAZZT client to receive and store the product files. There is a one-time fee of approximately $600. You can also customize the receive software to only store what you want to see.

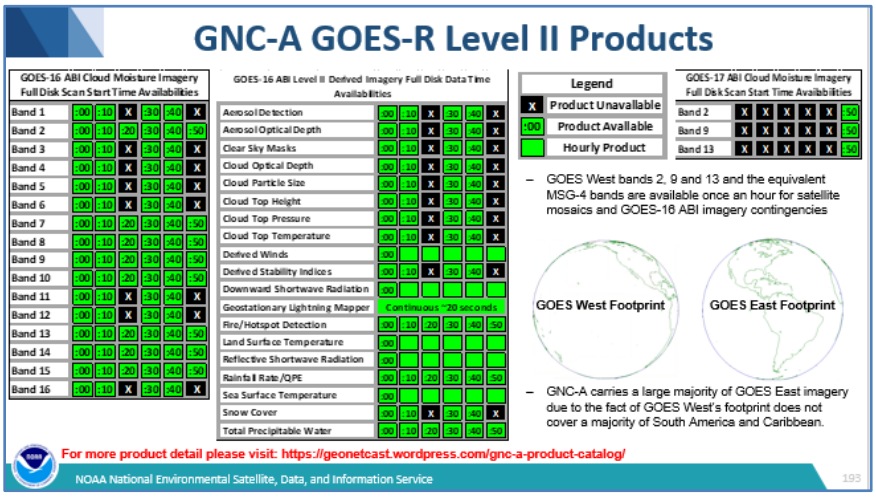


Figure 34: GOES Level II Products

Seth next briefed the level II products available on GNC-A. Figure 34 shows the product categories and products. There is a mixture of GOES East and West, EUMETSAT and JAXA (Japan) imagery and products. All sixteen bands of GOES East are available.

Seth then described some of the products on GNC-A aside from the DCS files. You can access the GNC-A product guide at https://geonetcast.wordpress.com/gnc-a-product-catalog/. There is more information, product user guides and tutorials on the GNC-A blog at https://geonetcast.wordpress.com/ and on the GNC-A NOAA website at https://www.geonetcastamericas.noaa.gov/, which will soon be moving to the NOAASIS https://www.noaasis.noaa.gov/ website. There is a set of visualization programs for the products at https://geonetcast.wordpress.com/showcast/.

Seth continued by briefing the GNC-A User Group. It is like the HRIT and GRB User Groups. He noted that there are training presentations on specific products. The user group meetings occur quarterly. There are programmatic updates and highlights of the SHOWCast software that is an open-source tool to visualize up to 150 products on GNC-A. It is available to download right off the broadcast and from INPE/Brazil. There are also user case studies.

Seth finished up with the points of contact related to GNC-A that is Figure 35.

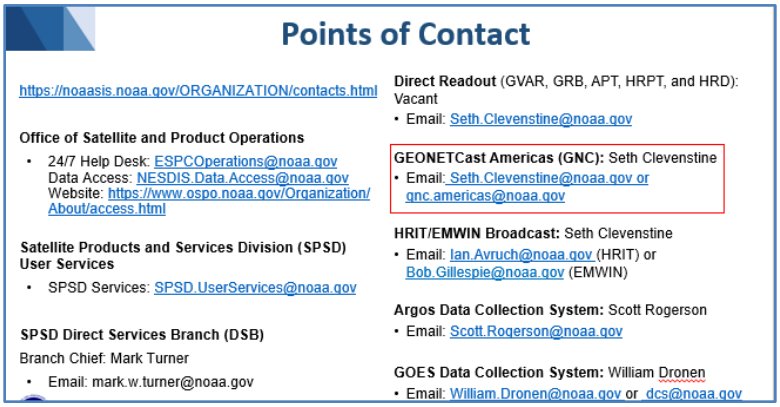


Figure 35: NESDIS OSPO Points of Contact

Questions and Answers:

The Question and Answers for this presentation begins at minute 3:17:24 of the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Question – Warren Dorsey: What size antenna dish is required?
Answer – Seth Clevenstine: The minimum is 1.8-meters. The recommendation is 2.4-meters. Some places in South America can use a 1.8-meter antenna but if you are surrounded by water etc., you probably need a 2.4-meter antenna.

Question – Warren Dorsey: What is the approximate station cost?
Answer – Seth Clevenstine: A turnkey installation is approximately $15-25K. It is higher if you go with full support and training from a provider.

The presentation slide (s) (GeoNet Cast _ DCS Data Clevenstine) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html

OpenDCS Update – Mike Neilson – USACE Hydrologic Engineering Center (HEC)

This presentation starts at minute 3:29:43 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

LySanias Broyles briefed the HEC Workshop that was held recently. As background, LySanias briefed that approximately four to five years ago there was an effort within the STIWG to standardize the OpenDCS software. OpenDCS was originally developed by Mike Maloney and his previous company Ilex. Later, Mike moved the software to his new company named Cove Software. OpenDCS is government funded. There are different versions that have different pieces to it. The Cove OpenDCS is the most common software version, per a STIWG survey. OpenDCS is an integral part of the USACE Hydrological Engineering Center Enterprise Water Management Software suite. Mike Maloney has had a contract to provide support for this. It was determined that an easier approach was to publish the software on GitHub and would provide a more unified platform. Thus, if you write or have software enhancements written, you can base it on the latest version on GitHub and then the enhancements can be included in the next Open DCS release. Mike Neilson has a team that is managing the OpenDCS software on GitHub.

In response to a question from Jim Conrad from the Army Spectrum Management Office on OpenDCS capabilities, LySanias briefed that OpenDCS is a suite of open-source software. It pulls in the data from various sources, then uses DECODES to transform the data into usable files or write it to a database. It can pull in data from sources to include HRIT, DRGS, NOAAPORT, and LRGS's like at EDDN. It is Java based; open-sourced software that has been built over many years. Since it is Java based, it is platform independent.

LySanias noted that there was a workshop held by Mike Maloney at the Hydrological Engineering Center for users to setup OpenDCS and understand the software. There was also a track for software developers. The main points from the HEC workshop are listed below. He noted that this is a critical time for OpenDCS as Mike Maloney is on a track to retirement.

- A mailing list was created at freelists.org : https://www.freelists.org/list/opendcs
  - Several people (including vendors) have signed up.
  - It is for all questions and concerns on OpenDCS.
- An initial set of qualifications to identify responsible parties was made to provide accountability for software integrity.
- A restapi and web interface web was presented which excited everyone. This interface will allow configuration of the OpenDCS software.
  - Keep an eye on https://github.com/opendcs/ for releases of OpenDCS and other components such as DCPMonitor.
- Two USACE staff have volunteered to modernize and maintain DCPMonitor. DCPMonitor allows us to see what is happening on the DCS channels and what the DCPs are reporting. We can identify collisions and identify message issues.
- An overview of the workshop and presentations are available here: https://github.com/opendcs/opendcs/wiki/Workshops-HEC2022

LySanias noted that there will be OpenDCS workshops every 6 months or so. This could obviate the funding structure that has been worked on for the development of OpenDCS.

Arthur Armour noted in chat that the web capability will be in OpenDCS so anyone can utilize it. The HydroDCS uses the standard version of OpenDCS so would have the web capability as well.
https://github.com/opendcs/opendcs/wiki/Workshops-HEC2022

Questions and Answers:

The Question and Answers for this presentation begins at minute 3:48:15 of the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Question – Warren Dorsey: Is OpenDCS an adjunct to the LRGS code? With Mike Maloney leaving, who will keep LRGS current?
Answer - Mike Maloney: LRGS is a component of Open DCS. The main modules are LRGS, DECODES, and a computation processor for the database. He has a contract with NOAA until June of 2023. This needs to be addressed before then. The contract is held by WCDAS.

The presentation slide (s) (Open DCS Update Neilson _ Broyles) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html .

User Reports – Good News, Success, and DCS Impacts: - William "Skip" Dronen – NOAA/NESDIS/OSPO/SPSD/ Direct Services Branch

Skip Dronen began the User Reports section of the agenda by noting that we solicit for "good news" or successes in the field regularly. They are posted on the NOAASIS GOES DCS website. They are used to communicate how important DCS is to the western hemisphere. Animated weather models, multi-colored displays and real-time stories in the field are important.

User Report – Chilean Navy: Juan Pablo Jorquera - Hydrographic and Oceanographic Service of the Chilean Navy

This presentation starts at minute 4:01:34 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Juan Pablo Jorquera began his presentation noting that they have 47 Chilean stations including two in the Antarctic region and one on Easter Island. They use three types of telemetry: GSM, BGAN and GOES. The GSM transmits every 5 minutes and BGAN every minute. He noted that 90% of their GOES stations transmit every five minutes. This is close to real-time data for them and is very important for the tsunami warning center. All their data is provided publicly as part of the Intergubernamental Oceanographic Comisión.

Juan Pablo then presented an example of a study case from an earthquake measuring 8.4 on the Richter scale from September 2015. The epicenter was in Coquimbo in North-Central Chile. The sea level station measured a tsunami with a height of 4.6 meters. They lost the GSM communication so GOES became very important. Figure 36 shows a picture of the tsunami trace and the DCS station.

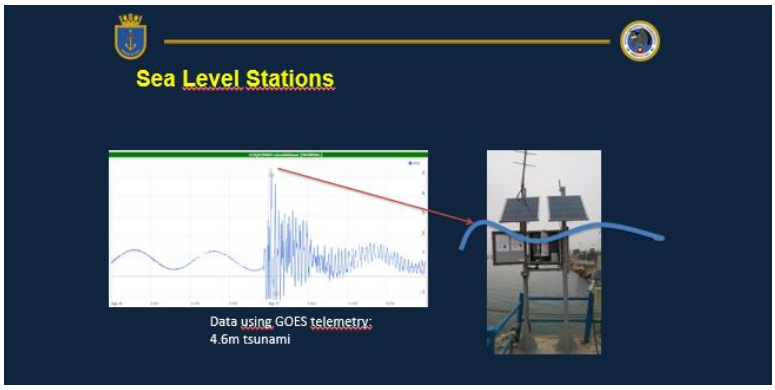


Figure 36: Example of a Tsunami Trace from a Chilean Navy DCP in 2015

Juan Pablo then noted the benefits of the GOES DCS Service. With the help of Letecia Reeves and Valerie Randall from the DCS Program Office Customer Service, they stood up a web portal to control of their traffic. They plan to migrate all the DCP transmission to five minutes. He concluded by offering his contact information to the STIWG.

Juan Pablo Jorquera G.
Head of Monitoring of real time equipment.
Sea level stations, wave/tsunami buoy and glider.
jjorquera@shoa.cl

Juan Pablo noted that they have a 2 DRGS systems to receive data using a 6-meter antenna.

Questions and Answers:

The Question and Answers for this presentation begins at minute 0:00:00 of the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Question – Skip Dronen: During the earthquake, was your DRGS your only source of DCS data or did you use the internet?
Answer – Juan Pablo Jorquera: They have three sources of DCS information.

Question – Warren Dorsey: Can they get the data through GNC-A?
Answer – Juan Pablo Jorquera: Will contact Seth Clevenstine

The presentation slide (s) (User Report CHILEAN NAVY JORQUERA) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html .

User Report – USACE: LySanias Broyles - USACE Rock Island District, IL

This presentation starts at minute 4:12:17 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

LySanias Broyles began his presentation by showing a map of the USACE districts. This is shown in Figure 37.

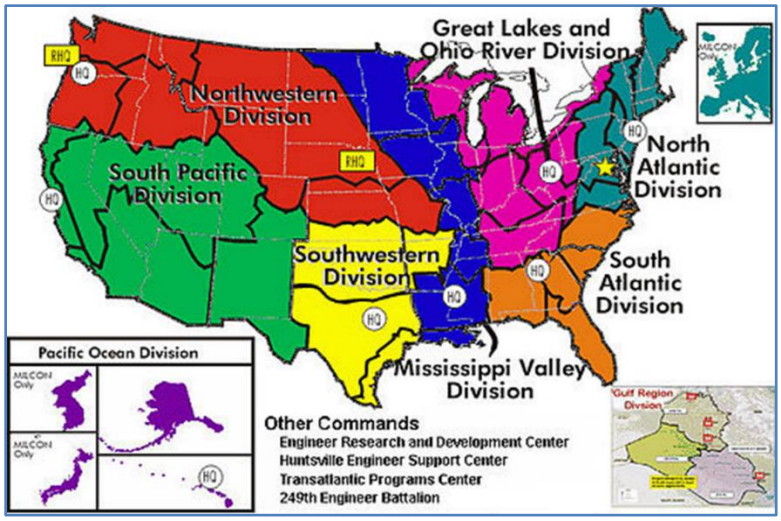


Figure 37: USACE Districts Map

LySanias noted that the majority of the USACE DCPs in the Eastern half of the country are river based and in the Western half they are mainly reservoir based. They pull in data from other agencies and have agreements with other agencies to maintain some DCPs. There are approximately 3000 USACE platforms.

LySanias continued with a description of the USACE modernization of their DRGS's. This is in light of the GeoXO Program and what DRGS will look like. In 2018, they awarded a contract with Alion to modernize and harden the DRGSs. They have 7 DRGS sites with eight DRGS's. Rock Island is unique as they have a DRGS pointed at both GOES East and GOES West. USACE was an early adopter of GOES DCS, thus many of their sites are over 30 years old with unsupported hardware. Also, some of the configurations were not conducive to the current electromagnetic environment. The Alion contract called for identifying the requirements for each USACE District as they are slightly different with different needs. The contract also included performing a site survey to understand the electromagnetic environment at each site. They also made recommendations on hardening each site. It was similar to the NOAA SPRES project, which has not been released yet. We are waiting for the SPRES report to use for comparison with the Alion reports. After the site visits, we began implementing the recommendations, part of which is to homogenize the architecture so that each of the seven sites would have new Microcom DRGS systems with pilot control modules, new dish antennas, new front ends, and all new infrastructure including the wiring harnesses. This included some physical barriers and climate control systems. We recognize the importance of having the relay from the spacecraft for our life, safety and water resource management requirements. The list of the seven sites is below.

- Rock Island, IL – GOES East/West – Installation complete
- St. Louis, MO (East) – Installation complete
- Vicksburg, MS (East) – Installation complete
- Columbia, MS (East) – Pending construction
- Cincinnati, OH (East) – Installation complete
- Omaha, NE (West) – Installation complete
- Sacramento, CA (West) – Installation complete

The only one remaining for installation is Colombia, MS.

LySanias noted that the following has been completed or in progress.

- Site surveys - Done
    - Radio frequency interference analysis - SPRES
    - Implemented recommendations for mitigation, physical security, etc. – Alion
        - This week a new fence is being installed at Rock Island.
- All eight site/system replacement projects - 90% complete
    - One site, Columbia, MS, remains to be started due to unrelated site construction
    - Racked dedicated hardware
    - Full complement of Microcom DRGS architecture

        - Redundant dual pilot control modules
        - Dual cage configuration with automatic demodulator/card failover
            - Complete system hot-failover at Rock Island hosting GOES East and West systems
        - Motorized dish azimuth and elevation control
- Interference monitoring systems
    - Construction to begin Spring 2022
    - Will have 6 systems and some mobile stations to detect, record and report terrestrial interference incidents at USACE DRGS sites
        - We will be able to identify the interferers and coordinate with them as the USACE DRGS sites were identified as protected zones

LySanias also noted that in 2014, they made a bulk purchase of 27 HRITs for the 25 districts. DRGS is still the primary, but we have HRIT as a backup.

LySanias ended his presentation by showing some images of their DRGS installations at Rock Island, which can be seen in the slide presentation, and by briefing a summary slide. The summary highlights are listed below.

- ~2936 owned GOES Id's
- ~2527 active GOES platforms (all 300 baud)
- Channels: 17, 25, 31, 49, 58, 73, 88, 161, 162, 177
- Divested nearly all primary terrestrial radio infrastructure
- Of 38 districts, over ~90% have at least one on premise HRIT receive system
- Still a desire for more frequent transmissions at critical locations
    - Some also transmit on random channel while exceeding observation threshold
- Supplementing GOES DCP's with r/t DAMS-NT over LAN at project offices.
- Resolved Corps-wide firewall issues granting access to all CDADATA and EDDN LRGS servers
- Continuing to add new locations and requesting new assignments
- Awaiting 2-Way GOES DCP's
- Anticipating Iridium observations over HRIT
- Ongoing USACE DRGS modernization nearing completion
- Actively involved in GeoXO requirements definition process

LySanias noted that there are more data on each division and their platforms in the slide presentation.

The presentation slide (s) (User Report USACE Broyles) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html .

Manufacturer Report – OTT Hydromet: Ashish Ravel

This presentation starts at minute 4:28:51 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Ashish Ravel from OTT Hydromet began his presentation by briefing the OTT Hydromet company structure. He noted there are three different vertical structures. They are Hydrology, Meteorology and Renewables. There are several companies making up these three areas.

He continued by reviewing the SATLINK3 family of products. They are the XLINK100, XKLINK500, SatLink3-Lite, SatLink3 and SatLink3 with Enc. He noted that SatLink3-Lite is their newest product. They use common components such as the Operating System and software.

Ashish continued with a description of SatLink3-Lite. It is designed for simple applications and is GOES capable only so is designed primarily for North American market, although is certified for EUMETSAT and other international telemetries. A list of highlighted characteristics is copied below. Ashish also noted that it is 30-40 percent less expensive than the fully-featured SatLink3. A list of characteristics is copied below.

- Designed for stations with simple applications and GOES only telemetry (Surface Water, Ground Water, and Met Stations)
- Built-in Internal memory (no SD card required)
- 3-year Warranty
- 32 Measurements
- Dual Independent SDI-12 Ports
- Tipping Bucket Input
- Supports Wi-Fi
- Uses Link Comm, no learning curve

He then compared the SatLink3-Lite with the SatLink3. His slide with the comparison matrix is shown below in Figure 38.

Figure 38: SatLink3 to SatLink3-Lite Comparison

Ashish continued his presentation with a description of a typical installation of a GOES system with their new omni antenna. It contains the omni antenna, radar, and WS600 rain sensors etc. The graphic of the station is shown in Figure 39. Ashish concluded his presentation by noting that they have been able to navigate the recent supply chain issues well. He noted that if you want to have products delivered by September 30th, please do not wait until late summer as they have a current lead time of 8 weeks.

Figure 39: OTT/Sutron SatLink Installation with a GEO Antenna

Questions and Answers:

The Question and Answers for this presentation begins at minute 4:39:06 of the audio file "Day2 1500 TWG Meeting-20220511 (vid").

Question – LySanias Broyles: LySanias noted the module for Iridium two-way communications. He asked Ashish if he knew what it would take to add a GOES two-way capability to the SatLinks or can you describe how difficult it would be to facilitate goes 2-way GOES communication?
Answer – Ashish Raval: Ashish noted that it is doable. Users can contact him, and he will contact an engineer. After a short back and forth, Ashish noted that the devices on the newer models are plug and play. You can take one modem out and plug the new one in. The operating system takes care of most of it. He noted that the current Iridium and cellular modems are between $700 and $1200.

The presentation slide (s) (ManfRep OTT Hydromet Raval) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html.

Manufacturer Report – Campbell Scientific: Mike Nelson

This presentation starts at minute 4:42:26 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

The presentation slide (s) (ManfRep Campbell Scientific Nelson) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html .

Mike Nelson, from Campbell Scientific, began his presentation by noting that he will address PDT update issues. He has noted that things are added and changed to stations in the field and the PDTs are never updated. He briefed that the DCP knows things about the station including the site ID, radio type, and manufacturer, latitude - longitude, the current date and date deployed, and the SHEF codes, in many cases.

Mike briefed that he looked to see if the information needed to automatically update the PDT is present at the DCP. In Figure 40 below, he has highlighted some of them in yellow.

Mike noted that he was able to pull the data out. He generated an option where a flag can be set, and by setting the "Generate_PDT" flag to true, a form is generated. The form is a text file. This can be downloaded and then uploaded as a batch file to DADDS later. You can see this process in Figure 41.
Mike continued by noting that if the batch file could be generated and verified by the technician, it could be sent out via a random channel. He is a little leery of disseminating this automatically via a random channel as it will use bandwidth necessary for critical messages.

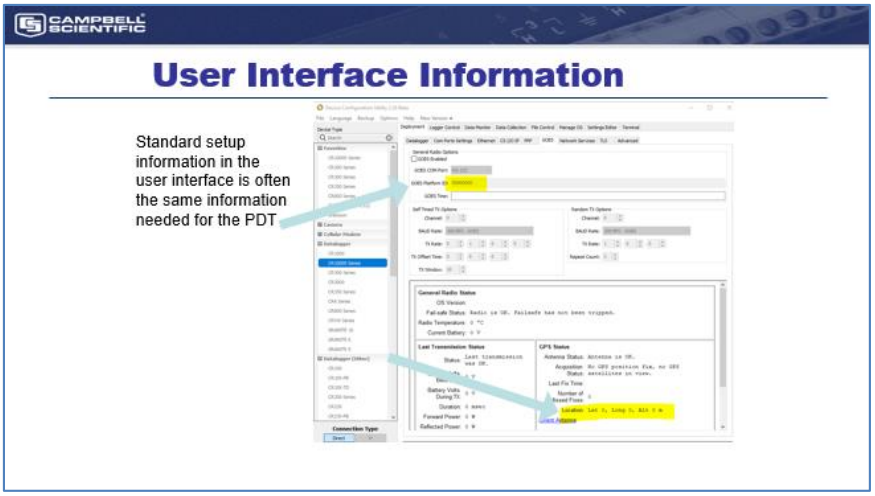


Figure 40: User Interface Information to Update PDTs

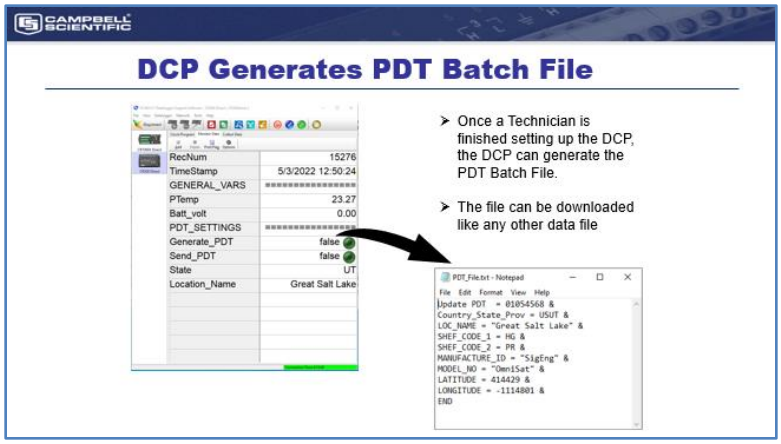


Figure 41: Auto-generation of a PDT Text File at the DCP

It might be better if there is a dedicated channel dedicated for PDTs. It might be necessary to compress the text file, so it does not require multiple random channel transmissions. This is shown in Figure 42.

From the manufacturer side, we can easily build this capability into the data loggers. Questions to be answered are

- Do we automate it?
- Do we just generate the batch file?
- Do we send it over the air?
- Would this be helpful to NOAA?
- Would the technicians need training?
- Would this be worth pursuing?

Questions and Answers:

The Question and Answers for this presentation begins at minute 4:49:06 of the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Question – Warren Dorsey. Does your unit generate latitude/longitude?
Answer – Mike Nelson: Yes. We can do it. It shows it in the batch file on Figure 41.
Comment – Mike Nelson: The fact is that if we define a format we want to use, it is easy to format it based on what NOAA requires.

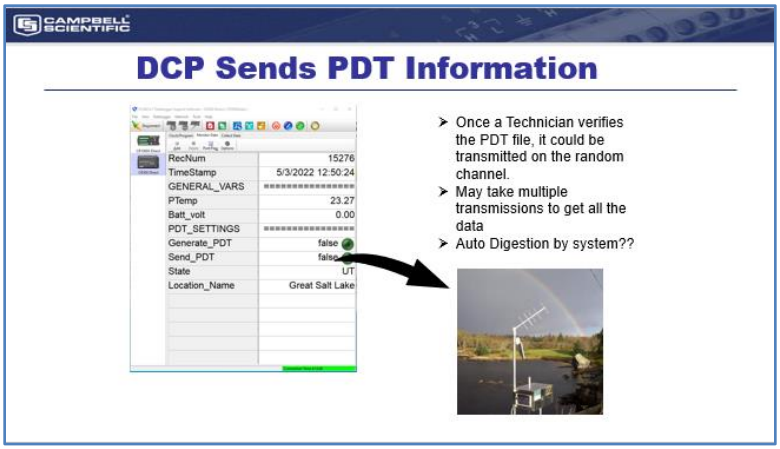


Figure 42: Notes on the DCP Disseminating the PDT Text File

Question – Brian McCallum: Any chance the sensor serial numbers can be transmitted?
Answer – Mike Nelson: The PDT has a lot of information about the DCP, especially about the transmitter portion. A DCP can be a radio and a data logger, which when paired together become a DCP. If there was a section for notes in the PDT, almost any information can be added. Sensor serial numbers have always been asked for. Some technicians set an unused analog channel to a slope of zero (0) and the offset to a sensor serial number so when they measure the analog channel, the voltage is multiplied by zero (0) then the serial number is added, and then that is transmitted, which is as waste of airspace as it very seldom changes. In a case like this, if you added the serial number as a general note, that would be useful.

Comment – Skip Dronen: I am creating an email list for those that want to be in on future discussions for the automated latitude/longitude issue.

Comment – Mike Nelson: Microcom is doing some prototype testing on what they are doing. It might be beneficial to have another manufacturer send some data through it.

Comment - Unknown: Satlink3 can append the latitude/longitude and serial number to the messages. It calculates the bandwidth you have on the back end of your transmission so you can append the date to the message without doing any programming.

The presentation slide (s) (ManfRep Campbell Scientific Nelson) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html.

Manufacturer Reports:

Manufacturer Report – Microcom Design: Perry West

This presentation starts at minute 4:55:25 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

The presentation slide (s) (ManfRep Microcom West) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html.

Perry West began his presentation by noting that Microcom has a data collection side as well as their data reception and data formatting/computation sides.

He showed a graphic of their featured product in this area which is the Xpress. The highlights are listed below. The components that are contained in the enclosure are shown in Figure 43.

- Fully integrated GOES DCS Data Collection Platform
  - GTX-2.0 Satellite Data Transmitter & Logger
  - UB6 Satellite Transmit Antenna
  - 5-Watt Solar Panel which can be upgraded
  - GPS Antenna
  - Internal Battery Pack
  - Solar Regulator
- Lightweight at 21 pounds

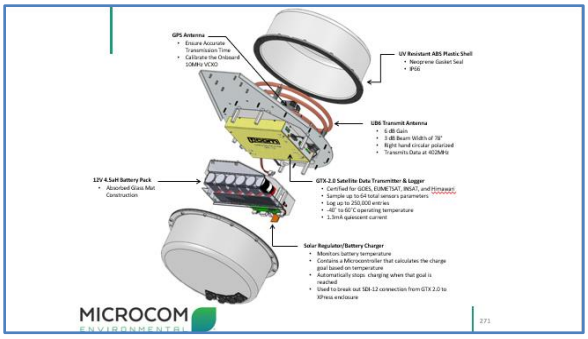


Figure 43: Xpress Components.

- IP66 Enclosure
- Mounting & Solar Panel options available
- Extremely cost-effective

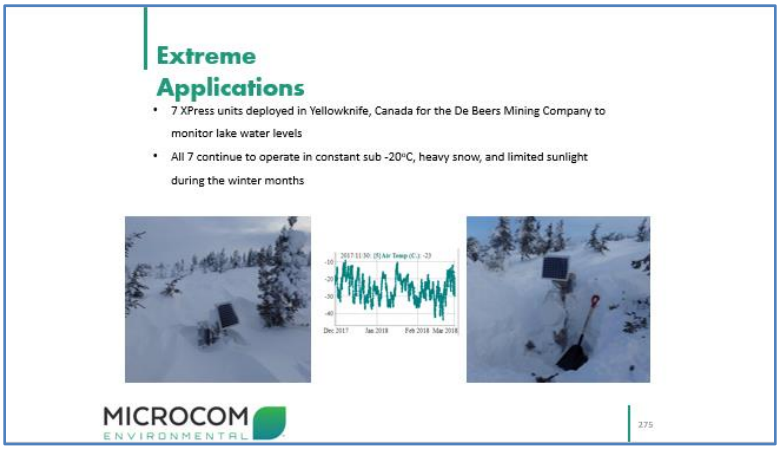


Figure 44: XPress Extreme Conditions Application - Winter

Perry noted that XPress is certified for GOES, EUMETSAT, INSAT, and Himawari. It can sample up to 64 sensor parameters, log up to 250,000 entries and operates within a temperature range of -40 to +60 degrees Celsius.

Perry continued by noting that it is applicable for long-term deployment. It is cost-effective and is a one-person setup. It also replaces the need for gage houses and enclosures. It is also suitable for seasonal deployment. For example, it is used for monitoring snow melt and then can be moved downstream to monitor drought and fire conditions in the Summer and Fall. One of the biggest uses for the Xpress is its rapid deployment feature. It can be used for additional monitoring in anticipation of extreme weather and flooding, post-flooding & post-wildfire monitoring. It can also be used as a temporary replacement for destroyed DCPs after extreme weather or other events. Another application is its use in extreme conditions as it is rated for a temperature range of -40 to +60 degrees Celsius. This is shown in Figures 44 and 45. The ones in the North have been deployed for 8 years.

Perry noted that there are tutorials on the system configuration within the GTX software which has the capability for customization. He briefed that Microcom can add an extend device to allow for additional sensor breakouts. There are different mounting options available. The only routine maintenance is to change the battery pack which should be done every 5 years.

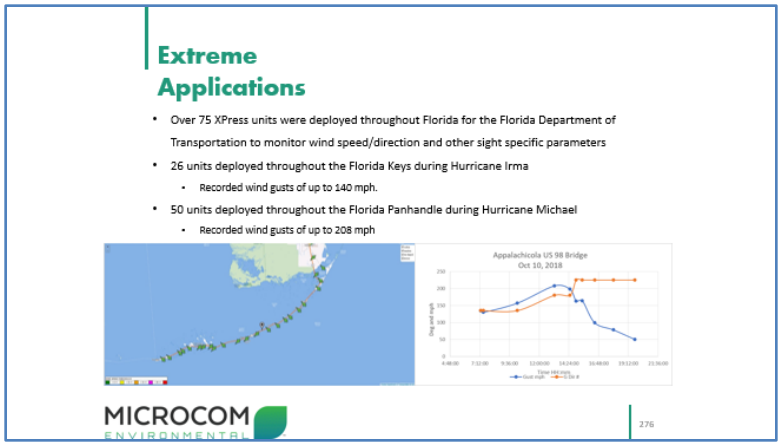


Figure 45: XPress Extreme Conditions Application - Summer

Perry noted that Microcom also sells receive systems. The highlights are listed below.

- DAMS-NT DigiTrak Direct Readout Ground System
    - Direct Reception from the GOES Satellite
    - Lowest latency
    - Most reliable
    - ≥ 3.7 Meter Dish
    - DCS Data Service (DDS): Redundant Internet based protocol to receive DCS messages from major NOAA and USGS DRGS installations (WCDA, NSOF, EDDN).

    - DAMS-NT HiQ: DCS message protocol that supports the Hi-Quality message statistics for better platform performance monitoring.
    - SQL Database Option: Message parameters, signal quality statistics, and message data (raw and decoded) stored in user provided database.

- DigiRIT HRIT Receive System
    - Rebroadcast of all DCS messages
    - Roughly 20 – 25 second Latency
    - Low-cost
    - 1.5 Meter Dish
    - Easy installation with 2 people
    - Multiple mounting options for various settings
    - Independent from DADDS & the internet for enhanced data reliability
    - Does not require a dedicated computer
    - Transfers data via an Ethernet connection

Perry concluding by showing the Microcom contact information listed below.

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Questions and Answers:

The Question and Answers for this presentation begins at minute 5:08:06 of the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Question – Unknown: Is there a maximum cable length that you can run from the antenna to the receiver?
Answer – Perry West: Cable length is dependent on the cable run. Up to 200 feet, we use LMR240; from 200 feet to 450 feet, we use LMR400; and anything above 450 feet we use LMR600. The longest run we have done was 700 feet for the LMR600 and that was ok for the DRGS installation but for the GPS antenna that is required you would need an in-line amplifier.
Comment – Brett Betsill: We do not like to go over 500 – 600 feet. Above that we want to think about going with fibre.

Question – Seth Clevenstine: The manufacture of the down converters that were made for the HRIT/EMWIN has ceased. Do you know if there are any alternatives?

Answer – Brett Betsill: No. We bought up the excess stock from Quorum when this occurred. Microcom's plan is to manufacture their own. As soon as we start running low on our stock we will get moving on that project. The LNB for the DRGS and for HRIT are very similar.

The presentation slide (s) (ManfRep Microcom West) can be found on the NOAASIS Web Page at https://www.noaasis.noaa.gov/GOES/GOES_DCS/twg_meeting.html.

Review of New Action Items: William "Skip" Dronen - NOAA/NESDIS/OSPO/SPSD/ Direct Services Branch

This presentation starts at minute 0:00:00 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

There were no new action items from the TWG. He noted that he reminds the TWG that anyone interested in the binary protocol, the latitude-longitude and the batch DCP updates to please contact him, and he will add them to his mailing list.

The Action Items can be found in Appendix I of the minutes on the NOAASIS Web Page.

Final Remarks and Close: William "Skip" Dronen - NOAA/NESDIS/OSPO/SPSD/ Direct Services Branch

This presentation starts at minute 5:15:58 on the audio file "Day2 1500 TWG Meeting-20220511 (vid)".

Skip Dronen noted that the next Technical Working Group meeting should be on the West Coast in Spring of 2023. We will plan for it to be in-person and virtual. If you would like to host the TWG, please contact LySanias Broyles or Skip Dronen.

The meeting was adjourned at approximately 16:00.

Appendix I: Action Items (from TWG 126 and 125)

New Action Items from STIWG 126 - May 2022

There were no new action items from the Spring 2022 TWG meeting.

Action Items from TWG 125 – April 2021

TWG Action 123-8 (from 122-10): NOAA to investigate back-up (remote) pilot options including reuse of Goddard equipment or a new system for the CBU. Short term project complete; long term solution in progress.

Update:

- This is In Progress and is due to be completed in the late Spring of 2022 with the installation of new parabolic antennas at the NESDIS Combined Backup Site (CBU) in Fairmont, WV.

Status: In Progress.

Appendix II: Agenda

	Tuesday, May 10, 2022	
	Day 1 - Session 1	**Presenter**
11:00	Welcome and Logistics	William "Skip" Dronen
11:15	DCS Program Update	William "Skip" Dronen
11:45	DCS Customer Service Update	Letecia Reeves
12:15	Small-Sat Update	Beau Backus
12:45	Wallops Update	Matt Sullivan
13:15	HRIT/EMWIN Update	Ian Avruch
13:45	**Break**	
	Day 1 - Session 2	
14:00	Binary Standard	Microcom
14:45	Automatic Latitude-Longitude	Microcom
15:15	Automated PDT Batch Updating	Microcom
15:45	New Action Item Review / Close	William "Skip" Dronen

	Wednesday, May 11, 2022	
	Day 2 - Session 1	
11:00	Welcome and Logistics	William "Skip" Dronen
11:15	Spectrum Sharing	Dave Lubar
11:45	Radio Frequency Interference	Beau Backus
12:15	USGS Depot Update	Laura Flight
12:45	DADDS Configuration Repository	William "Skip" Dronen
13:30	**Break**	
	Day 2 - Session 2	
14:00	GEONETCast & DCS Data	Seth Clevenstine
14:30	Open DCS Update	Mike Neilson
15:00	User Reports - Good News, Success, DCS Impacts	
15:30	Manufacturer Reports	OTT Hydromet, Campbell Scientific, Microcom
16:15	Review of New Action Items / Close	William "Skip" Dronen

Appendix III - A: Day 1 - May 10th, 2022 126th TWG (Virtual) Attendees

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