LRIT/HRIT/EMWIN

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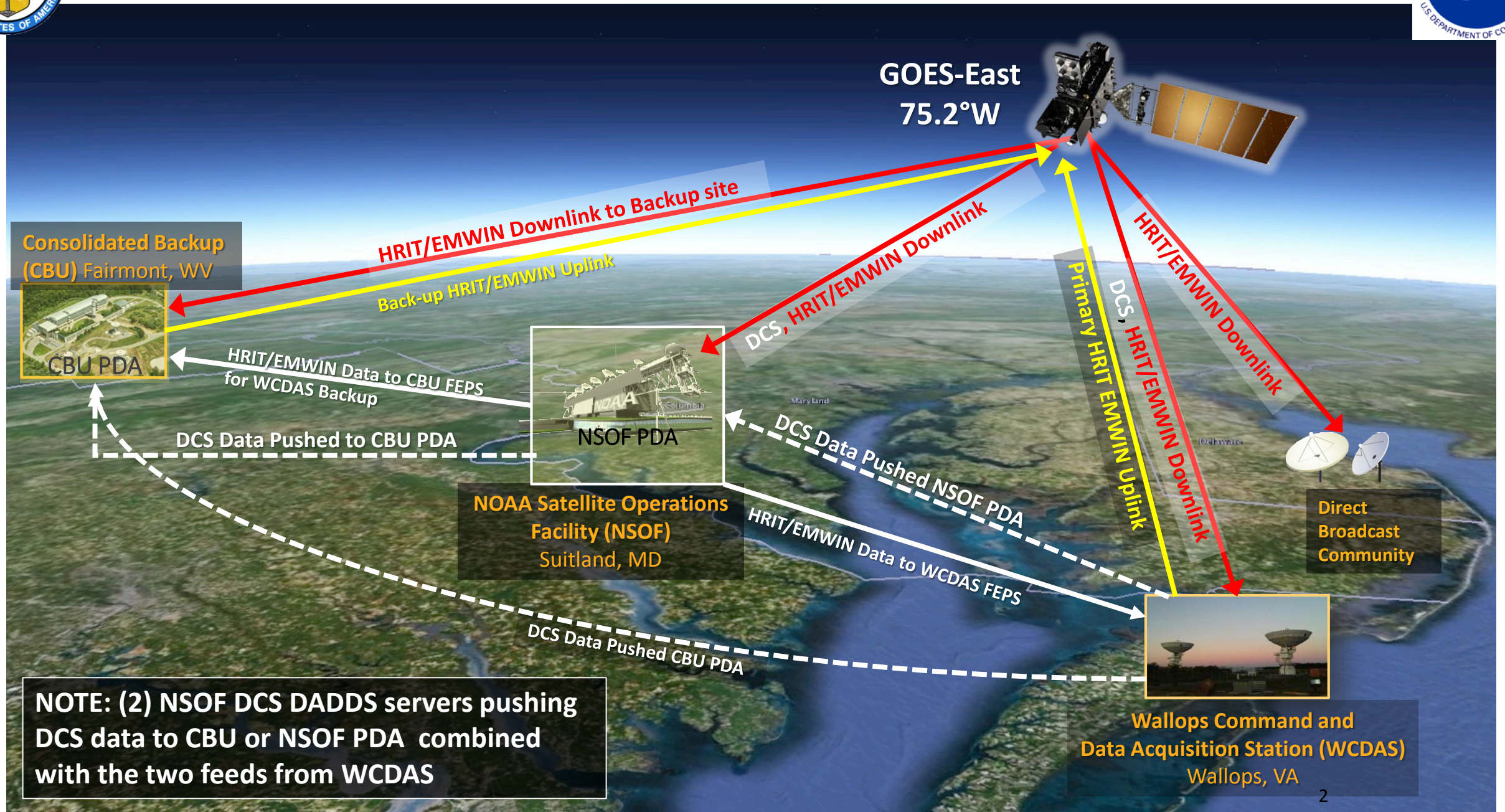
GOES Data Collection System

Technical Working Group (TWG)
and
Satellite Telemetry Interagency Working Group (STIWG) Meetings

Miami, FL

March 2018

GOES East DCS to HRIT/EMWIN Operations



Current Status of LRIT & HRIT/EMWIN

- GOES (15) West (135°W) operating from Legacy LRIT system
- GOES East (75.2°W) operating from the PDA driven HRIT/EMWIN system.
- GOES-17 (89.5°W) future broadcast will be operating from the HRIT/EMWIN system (TBD).
  - Legacy LRIT (domains 2-5) system will be decommissioned.
- HRIT/EMWIN Product List
  - EMWIN products including watches, warnings, forecasts and graphics
  - Copy of the GOES-DCS observations provided from DADDS
  - Environmental products from NHC, such as tropical weather and forecasted maritime surface charts
  - Himawari-8 imagery – Full Disk VIS, IR and WV every 60 minutes
  - GOES-16 products –ABI Cloud and Moisture Imagery (CMI)
    - Full Disk imagery on bands 2, 7 ,8, 9, 13, 14, 15 every 30 minutes at 2km resolution
    - Mesoscale imagery on bands 2 (1km), 7 and 13 every 15 minutes at 2km resolution

HRIT/EMWIN Virtual Channel ID & Product Listing

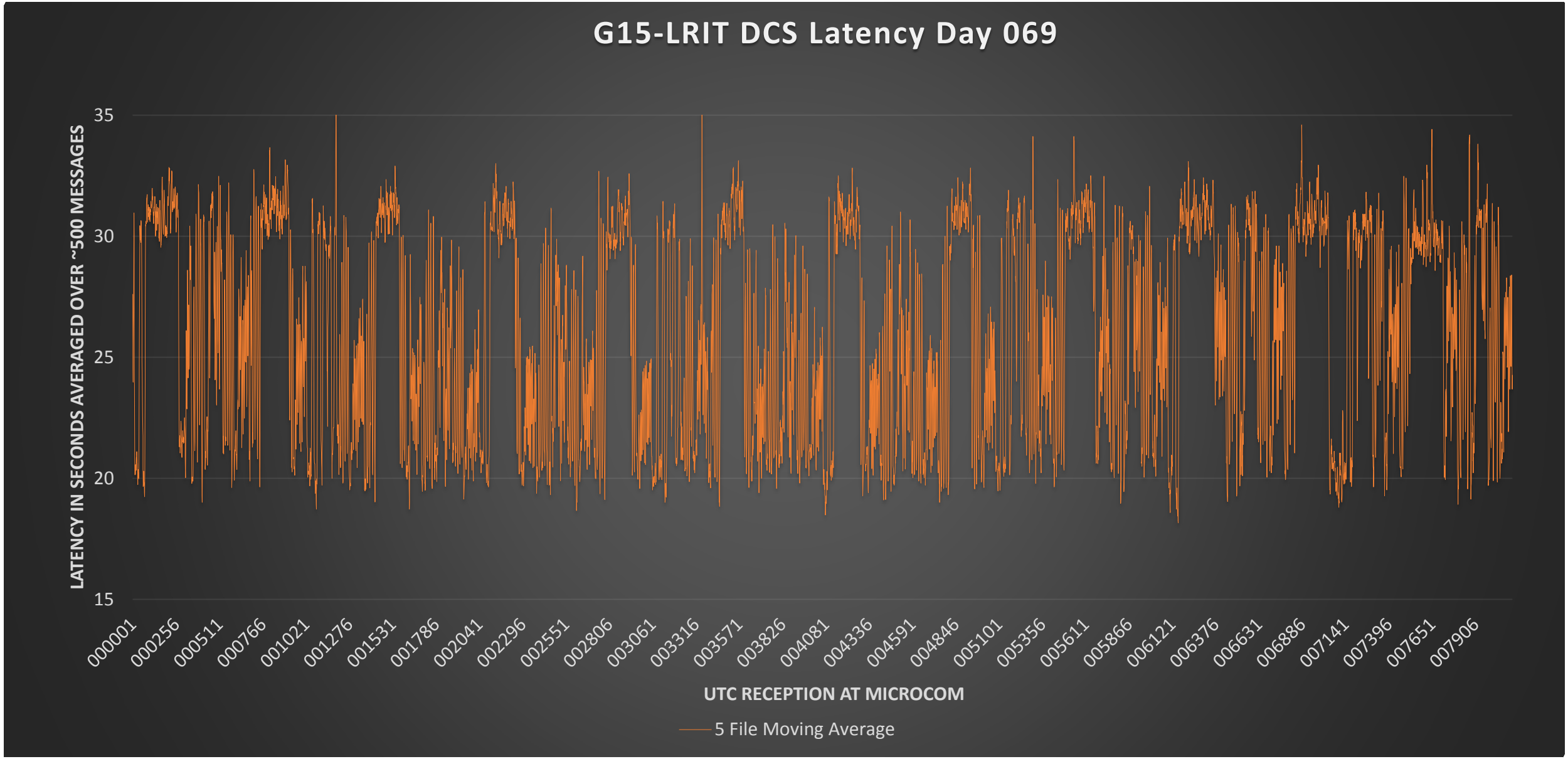
VCID #	Product Name	Period -Minutes	Format	Source Link
0	Admin Text	60	Text Messages	N/A
1	Mesoscale 1 Km box (Bands. 2, 7, 13)	15	NetCDF4	https://www.goes-r.gov/spacesegment/abi.html
2	CMI Band 2	30	NetCDF4	https://www.goes-r.gov/education/ABI-bands-quick-info.html
6	GOES-15 IR FD and NH	30	LRIT	http://www.goes.noaa.gov/goesfull.html
7	CMI Band 7	30	NetCDF4	https://www.goes-r.gov/education/ABI-bands-quick-info.html
8	CMI Band 8	30	NetCDF4	https://www.goes-r.gov/education/ABI-bands-quick-info.html
9	CMI Band 9	30	NetCDF4	https://www.goes-r.gov/education/ABI-bands-quick-info.html
13	CMI Band 13	30	NetCDF4	https://www.goes-r.gov/education/ABI-bands-quick-info.html
14	CMI Band 14	30	NetCDF4	https://www.goes-r.gov/education/ABI-bands-quick-info.html
15	CMI Band 15	30	NetCDF4	https://www.goes-r.gov/education/ABI-bands-quick-info.html
20	EMWIN - Priority	Variable	Text	http://www.nws.noaa.gov/emwin/EMWIN_Image_and_Text_Data_Capture_Catalog_table_v1.1_r171002_1350.pdf
21	EMWIN - Graphics	Variable	Graphic (e.g. GIF, JPEG)	http://www.nws.noaa.gov/emwin/EMWIN_Image_and_Text_Data_Capture_Catalog_table_v1.1_r171002_1350.pdf
22	EMWIN - Other	Variable	Text and Graphic	http://www.nws.noaa.gov/emwin/EMWIN_Image_and_Text_Data_Capture_Catalog_table_v1.1_r171002_1350.pdf
23	NWS Products	60	Graphic	http://www.nhc.noaa.gov/tafb_latest/
24	NHC Graphics Products	60	Graphic (e.g. GIF, JPEG)	http://www.nhc.noaa.gov/tafb_latest/
25	GOES-R JPEG Products	None At This Time	JPEG	http://www.ospo.noaa.gov/Products/imagery/index.html
26	Int'l Graphics Products	60	Graphic (e.g. GIF, JPEG)	http://www.ospo.noaa.gov/Products/imagery/index.html
30	DCS Admin	Continual	Text	https://dcs1.noaa.gov/Account/Login
31	DCS Data	Continual	Formatted Text	https://dcs1.noaa.gov/Account/Login
60	Himawari	60	LRIT	http://www.data.jma.go.jp/mscweb/data/himawari/index.html

DCS Prioritization/Bandwidth Utilization on HRIT/EMWIN System

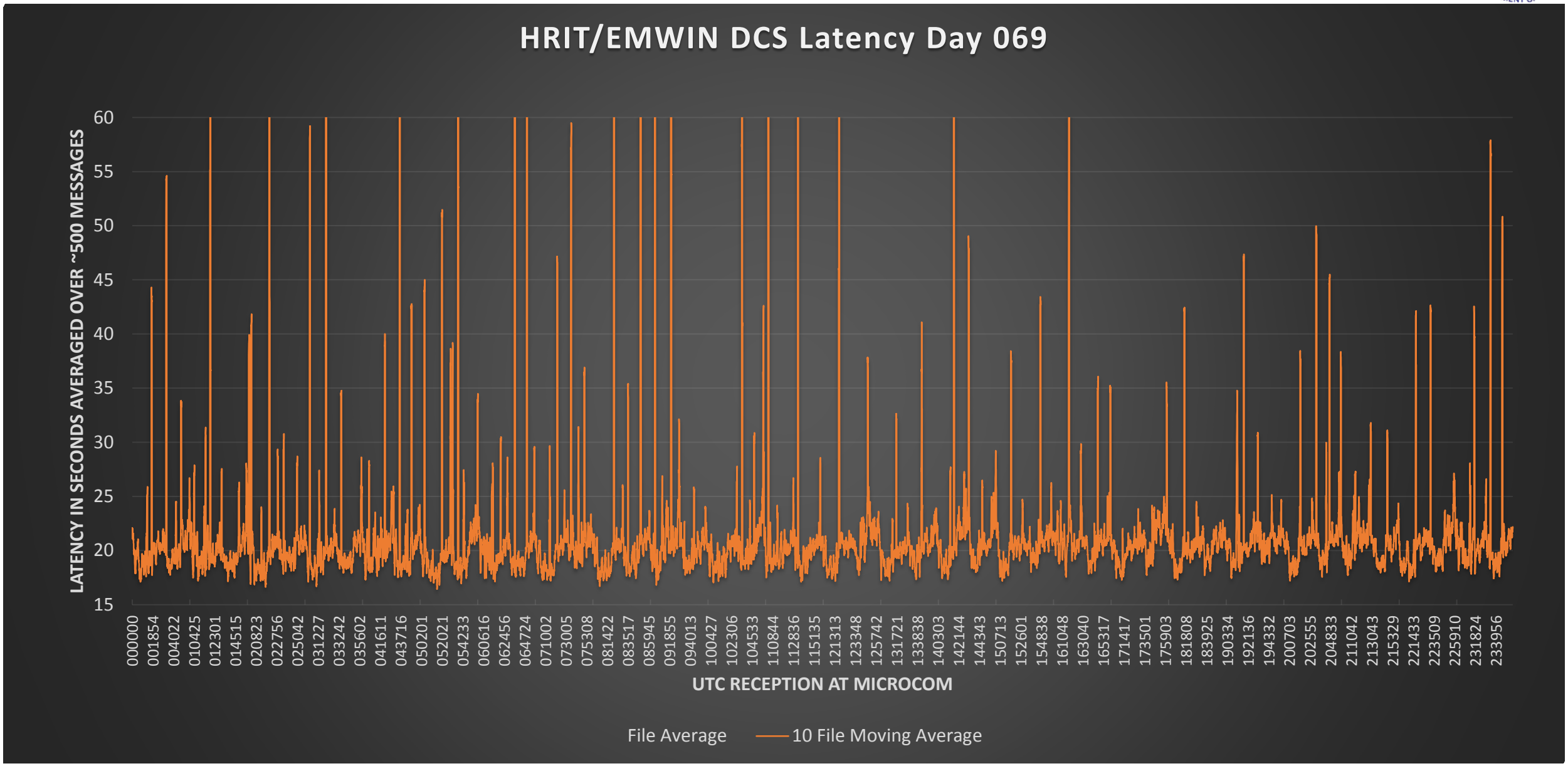
Group Name	Guaranteed Bandwidth	Maximum Bandwidth	Group Order Rank
EMWIN	13%	20%	1
DCS	5%	10%	2
Imagery	67%	100%	3

	NSOF PDA	CBU PDA	Daytime Hourly Bandwidth %	Night time Hourly Bandwidth %
GOES-16 Mesoscale Imagery	X		4%	2%
GOES-16 FD Imagery	X		51%	41%
GOES DCS Data	**X**	**X**	**3.73%**	**3.73%**
EMWIN	X	X	6%	6%
Environmental Charts (NHC)	X	X	<1%	<1%
Himawari-8 Imagery (JMA)	X	X	3%	3%
Legacy GOES FD AFEP Imagery	X	X	6%	6%
Averaged Totals			~75%	~62%

GOES-15 Averaged DCS on LRIT Latency Julian Day 069

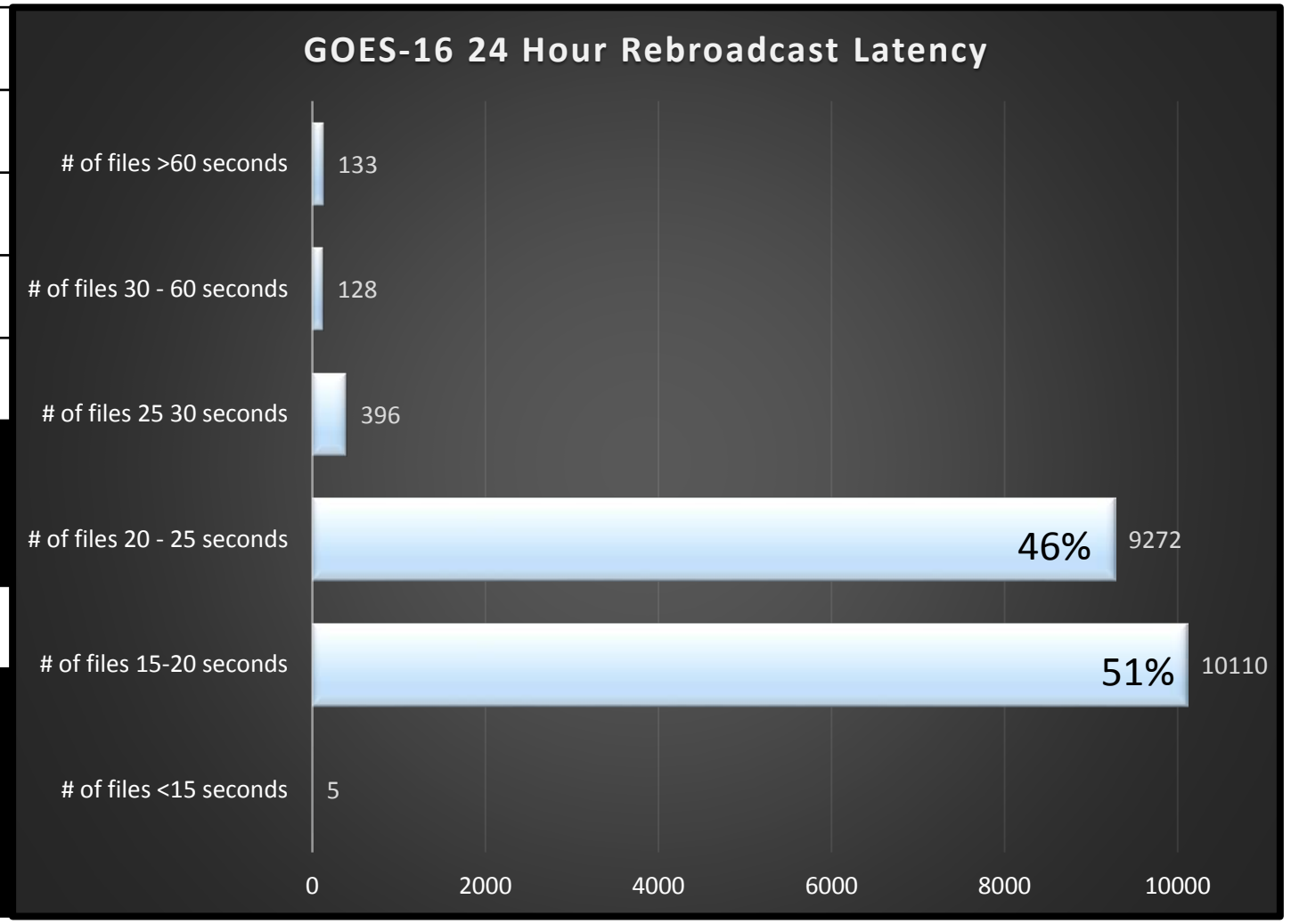


GOES-16 Averaged DCS on LRIT Latency Julian Day 069



GOES-16 DCS on HRIT Latency Julian Day 069

	HRIT	LRIT
Count% > 30 seconds	1.28%	29.22%
Max. Latency (seconds)	586.6	51.4*
Min. Latency (seconds)	14.5	16.8
Total Mean (seconds)	21.2	26*
Mean w/o >30 files	20.0	
Average Mean >30	112.5	
Total messages sampled	815201	812400
Total messages affected	10452	
Average DADDS Latency	4.7	
Average PDA Latency	15.2	



*Note: Higher latency values from LRGS files anomalously included in the broadcast were observed, but not recorded in this analysis.

DCS on HRIT/EMWIN Observed Issues

Past DCS HRIT/EMWIN Updates

- ENTR-4495/4496 – Removing unnecessary calls to PDA databases for DCS files
  - Deployed to both CBU and NSOF on February 9th, 2018.
    - High latencies were observed after GOES East transition that coincided with polar NPP passes.
    - Removed "calls" to the database for every DCS file SFTP transaction
    - Reduced latencies back to nominal levels, except the intermittent spikes still observed

DCS Specific HRIT/EMWIN Updates

- ENTR-4263 – Fast tracking tailoring HRIT/EMWIN data through PDA
  - Projected to be implemented in Early summer 2018
    - Latencies spikes should be eradicated by making HRIT/EMWIN data have it's own specific tailoring VM
- ENTR-4015 - HRIT/EMWIN periodically broadcasts duplicates files
  - Projected to be implemented in Early summer 2018
    - Duplicated files should be eradicated by this change (affects imagery the most) and improve overall broadcast efficiency
- ENTR-4155 – HRIT Packet Format Error reported by Microcom
  - Projected to be implemented in Early summer 2018

Key 2018 Dates for HRIT/EMWIN

- **HRIT/EMWIN Working Group Meeting –** April 26th, 2018
  - Please email me if interested in joining and learning more about HRIT/EMWIN
  - Agenda items include, GOES-16 and S status, future HRIT/EMWIN products, new stream configurations, key future dates, observed issues and open discussion
- **PDA 3.1 Install** – April 2018
  - Key change for time-triggered subscriptions to HRIT/EMWIN
- **GOES-S HRIT/EMWIN data flow from FEP's (without Cloud Moisture Imagery)**
  - ~Possibly L+ 90 (estimated from GOES-R timeframe)
- **PDA 3.2 Install** – Summer 2018 (TBD)
- **EMWIN Enterprise system operational date –** July 9th, 2018 (estimated)
  - GOES East users must use GOES-14 EMWIN only broadcast in meantime
- **Geostationary Lightning Mapper data available to HRIT –** Summer 2018 (TBD)
- **GOES-S HRIT/EMWIN Post Launch Test** – Summer 2018 (TBD)
- **GOES-S to GOES West Transition –** Fall of 2018 (TBD)

Contact Information

HRIT/EMWIN Broadcast

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EMWIN

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Backup Slides

Description of the Broadcast

Characteristic	HRIT/EMWIN Broadcast Specifications
Platform	**Operational East and West GOES-R Series Satellites**
Operating Frequency Range	**L-band**
Center Frequency	**1694.1 MHz – Due to this frequency change, users will need to upgrade receivers.**
Data Rate	**400 Kbps**
Symbol Rate	**927 Ksps**
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 *Existing antenna's used specifically for the LRIT broadcast should be compatible with the HRIT broadcast***

Receive System Components - General

Component	HRIT/EMWIN Broadcast Specifications	Additional Information

Platform	**Operational East and West GOES-R Series Satellites**	• **GOES-16 at 75.2 West**
		• **GOES-17 at 137.0 West (TBD)**
		  o **Launched March 1, 2018**
		  o **Predicted Operational West Fall of 2018**

Broadcast	**Operating Frequency Range**	**L-band**
	Center Frequency	**1694.1 MHz**
	Data Rate	**400 Kbps**
	Symbol Rate	**927 ksps**
	Modulation - BPSK	• **Convolutional rate ½ code with constraint length 7 concatenated with Reed Solomon (255,223) with Interleave = 4** • **Square Root Raised Cosine filtering using an Alpha factor of 0.3** • **The resulting "Necessary Bandwidth" for this signal will be 1.205 MHz**
	Polarization - Linear	**Vertical Offset**
Antenna System	**VSAT**	• **At 5 degree elevation, the minimum antenna is 1.2 meter.** • **At 10 degrees or more elevation the minimum size is 1.0 meter**
Low-Noise Block-Down Converter	**L-band**	**Example:** • **Input 1691 MHz** • **Output 137.5 Mhz**
Satellite Receiver	**L-band**	• **BPSK 1691MHz to 137.5MHz**

Software	**N/A**	• **De-encapsulates HRIT/LRIT files**
		• **Visualization and Manipulation of Files**
		• **Optional Applications (examples)**
		  o **EMWIN visualization application**
		  o **GOES-DCS database software or application**