



DIFI Plugfest

Government & MIL STD updates

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Oct 8th, 2026

Agenda



- Disclaimer
- Driving principles of digital IF integration for gov
- PdM WESS digital IF initiatives
- Other digital IF initiatives (Army, Navy, Space Force)
- PdM WESS MIL STD proposed updates (LM and DM)
- PdM WESS MIL STD block diagram conventions
- PdM WESS POCs
- WGS Certification Group POCs



Disclaimer



- I am a DIFI Consortium representative and a Viasat employee.
- I am providing this brief because AJ Vigil cannot be here.
 - I do not represent the US Government
 - I can not speak for the US Government
 - I cannot commit the US Government to any decisions; purchasing, logistics, managerial or otherwise
 - I will provide US Government POCs related to this effort on the last slide.

If you ask me what the official US Government stance is on anything, I will look at you like this:



DIFI integration for gov - motivators



- Four Pillars of Digital IF that stand out to US Gov:
 - Interoperability
 - Management Automation (think large-scale teleports, gateways)
 - Performance (WGS certification, best throughput per mission)
 - Roadmap to digital IF integration & interoperability (in progress)
- There are three aspects of WGS certification for Digital IF systems:
 - Protocol (addressed with the DIFI overlay)
 - Networking Performance (TBD, overlaps IEEE 802.X rules)
 - Signal Performance (covered below)



PdM WESS Digital IF Initiatives



- **PdM WESS has either actively contributed to or driven the following efforts**
- **Digital IF SubSystem (DIFS) Inc. 1**
 - RFI released roughly 2024-2025, Follow-up pending
 - Outlines initial push to update gov SATCOM ground infrastructure
- **WGS Cert for digital IF**
 - Managed by USSF 53rd Space Operations Squadron (53SOPS) Mission Delta 8 Wideband (MD8 WB) working group
 - PdM WESS organizing, collating input from DIFI Consortium + external sources
- **Digital IF Management Automation (DIMA)**
 - Evaluates SATCOM M&C as well as automation solutions
- **Distributed Aperture Resilient Terminal System (DARTS)**
 - RFI released Sept 1st, 2026



Other Digital IF Initiatives

- MUOS is using DIFI standard-compliant digital IF between nodes at ground stations
 - Direct-to-KA DSP between nodes (no IF-band in between)
 - Driven by Auria Space (prime)
- MORA & VICTORY – VITA 49.2 variants used by Army DEVCOM
 - Modular Open RF Architecture (MORA)
 - Unclass/CUI, high-volume, high-throughput digital IF
 - Vehicular Integration For C4ISR/EW Interoperability (VICTORY)
 - Class/TS low-volume M&C digital IF for HAIPE automation
- Space Force working with NOAA
 - Digital IF for Earth observation applications



Proposed MIL STD updates – LM



- **This is NOT a comprehensive list, just highlights**
- Primary focus is on FDMA for Increment 1
- Legacy Modem (LM)
- Revisions Proposed to MD8 (brief):
 - Revisions to IF output frequencies and step size measurements
 - Refine definitions for modulation, coding, data and symbol rates
 - Error rate interoperability performance steps improved to match current-gen COTS modems
 - Work to bring ACM into WGS mainstream operations
 - Focus on modcod monotonicity at E_s/N_0 (not SNR or E_b/N_0)
 - Spot-check IF Impedance & VSWR with Smith Chart, S-parameters
 - Revise clock accuracy and rate requirements to match current-gen COTS modems

Proposed MIL STD updates – DM



- **This is NOT a comprehensive list, just highlights**
- Primary focus is on FDMA for Increment 1
- Digital Modem (DM)
- Revisions Proposed to MD8 (brief):
 - BER curve interoperability matrix, including LM -> DM, DM -> LM, etc.
 - Different curves will exist based on if modem is legacy or digital
 - Enhanced spectral mask / more aggressive rolloff requirements
 - Revisions to test at baseband or near-baseband
 - Revise or cut requirements for serial data rate, clock accuracy, etc.
 - Test locations move to different nodes throughout the digital IF infrastructure
 - Cut requirements for isolation, implementation loss, spurious & harmonic emissions
 - Mod & demod now exist in software or firmware and are physically separate from each other

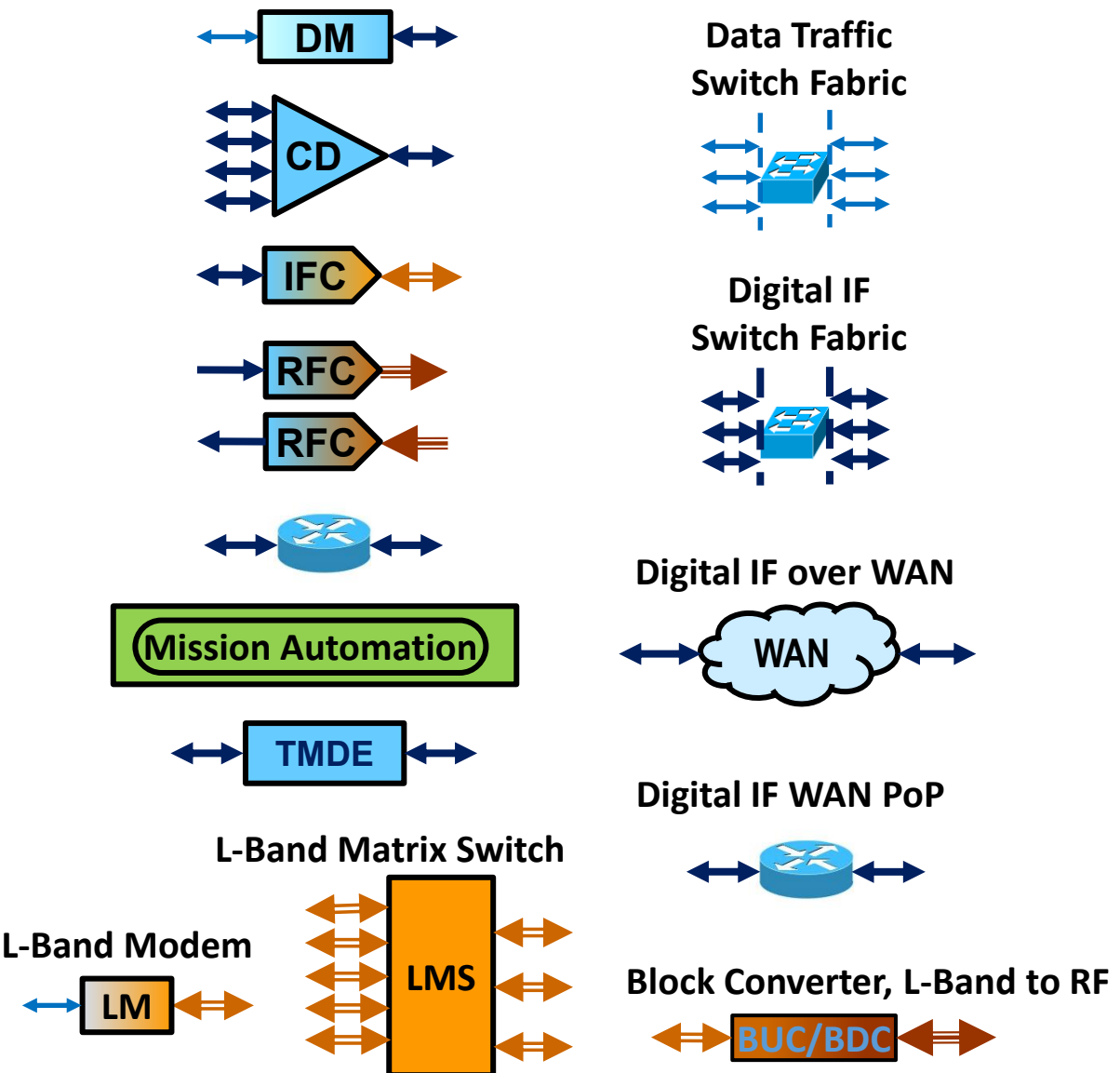
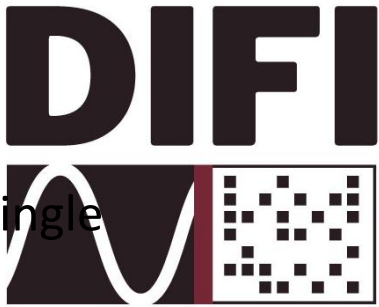
PdM WESS block diagram conventions



- Proposed to unify path architecture diagrams
- Rationale:
 - Consistent Graphics
 - No red – nothing is classified
 - Shapes help those who are colorblind or B/W printer limited per facility
- Creates unified “visual language” for gov and WGS cert digital IF design → implementation → integration → test work



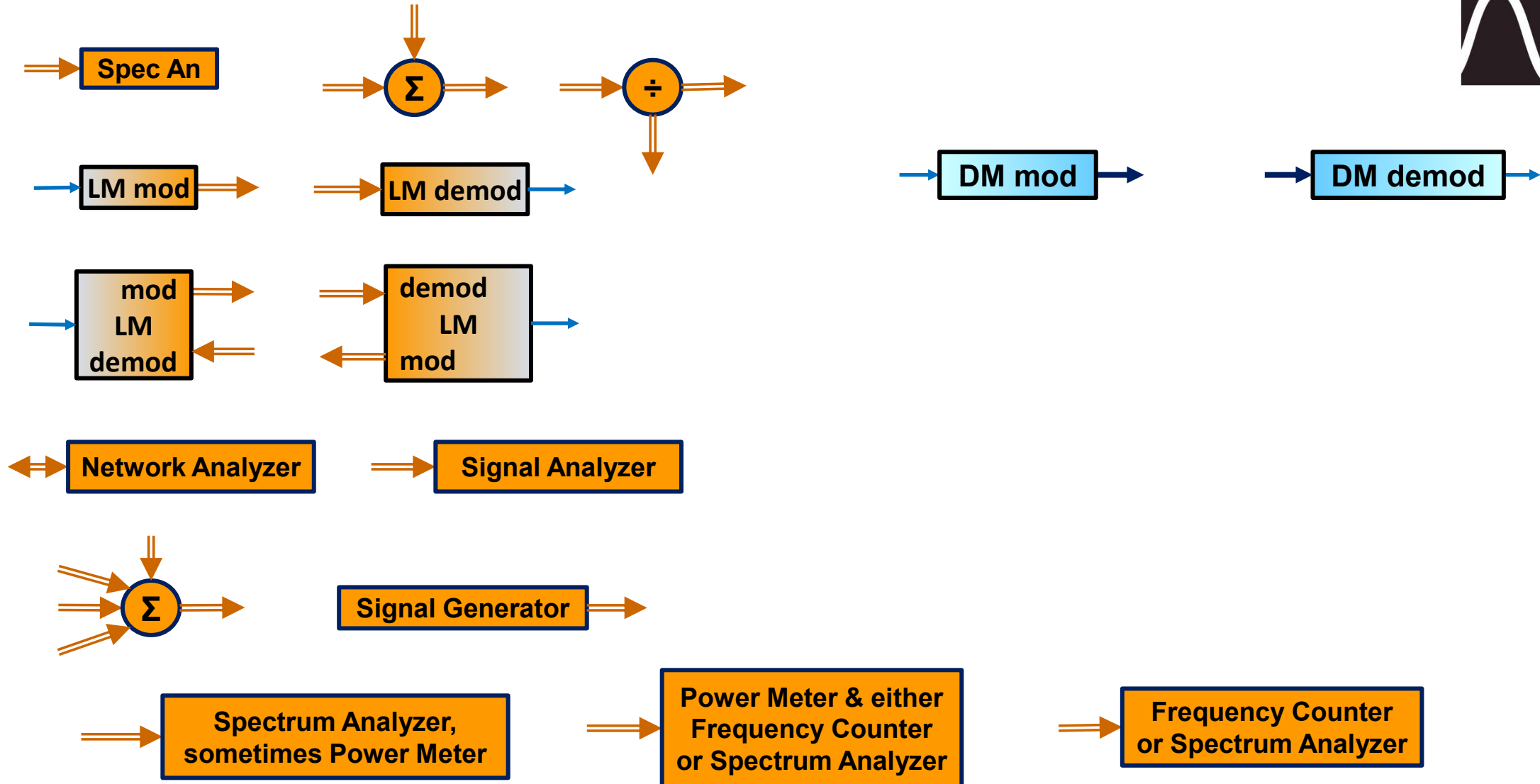
PdM WESS block diagram conventions



- Data Traffic light blue, 2 point, single
- Digital IF dark blue, 3 point, single
- L-Band IF light brown, 4 point, double
- RF dark brown, 5 point, triple
- M&C light green, 1.5 point, single

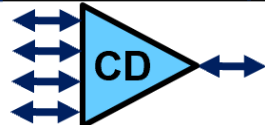
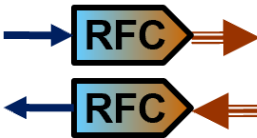
Rationale: *consistent graphics*
no red (nothing is classified)
shapes help those who are colorblind
or B/W printer limited

PdM WESS block diagram conventions



Digital IF “Building Blocks”



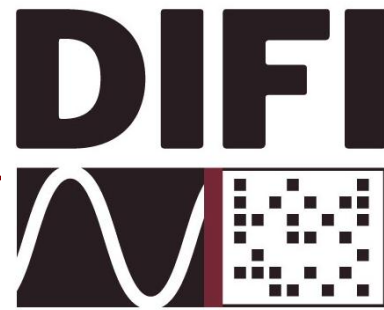
Digital IF Modem		Modulates data traffic into Ethernet Digital IF streams. Demodulates Ethernet Digital IF streams into data traffic.
Digital IF Switch Fabric		Local network of commercial <u>high speed</u> switches distribute Ethernet Digital IF streams throughout SATCOM facilities.
Digital IF Combiner-Divider		Combines multiple Digital IF stream channels into one on uplink. Channelizes single downlink into multiple Digital IF stream channels.
IF Converter		Converts Ethernet Digital IF into L-Band on uplink. Converts L-Band to Ethernet Digital IF on downlink.
RF Converter		Converts Ethernet Digital IF directly into RF on uplink. Converts RF into Ethernet Digital IF on downlink. Suitable for HPA integration on uplink and LNA integration on downlink.
High Speed WAN <u>PoP</u>		High Speed WAN Point of Presence (<u>PoP</u>) provides terrestrial Digital IF connectivity to other SATCOM facilities in the general region.
Mission Automation		Supports operator by automating resource management, signal chain orchestration, equipment configuration, and mission management. Delivers data analytics.
Test, Measurement, and Diagnostic Equipment		Digital IF domain Test, Measurement, and Diagnostic Equipment (TMDE) Outputs Digital IF test signals, directly measures Digital IF performance, and introduces Digital IF impairments at Ethernet.

Government WGS Cert POCs



- JSEC
 - Tom Bock WGS Cert Team
 - Charles Hall WGS Modem Cert Team Lead
 - Matt Lewis WGS Cert Team
 - Minh Nguyen Digital IF Specialist
- MD8 / 53SOPS
 - Shane Hillstead WB Engineering Chief
 - Jim Stidam WGS Modem Cert Lead
- PdM WESS
 - AJ Vigil Program Engineering Lead
 - Matt Eckert Terminal Certification Lead

Notes from AJ



- That might not be a bad idea.
Lots of content there, but you can recap.

Important points:

- heavy disclaimers. You don't represent the Govt. You can't speak for the Govt. You can't *commit* the Govt. Same disclaimers as mine, just stronger.
- four pillars of Digital IF: interop, management automation, performance (hence WGS Cert), roadmap (in progress)
- three aspects of WGS Cert for Digital IF systems: 1) protocol (DIFI "overlay"), 2) networking performance, 3) signal performance (focus of LM vs DM deck)

RECOMMEND ALSO: move select "publicly available" content from "LM vs DM" deck to a new stand-alone deck on your own template, ViaSat or otherwise, not PdM WESS. I would have used my "Systek" template. Just cite your sources with footnotes in slides.

- More:

Include a slide with WGS Cert contact info.

- USSF 53SOPS MD8 WB Engineering
- Jim Stidam, Modem Cert Lead
- Matt Eckert, Terminal Cert Lead
- WGS Cert for modems or terminals begins with a "welcome package" they send you

Include a slide with just a laundry list of PdM WESS Digital IF initiatives. PdM WESS "shout-out." Cite RFIs and/or past presentations. High level info should be publicly available.

- DIFS Inc1 (Digital IF Subsystem, Increment 1), an RFI was released some time ago and a follow-up is pending
- WGS Cert for Dig IF - actually USSF 53SOPS MD8 WB Engineering - but PdM WESS is supporting this in a big way
- DIMA (Digital IF Management Automation), one of several DoW SATCOM Management Automation initiatives
- DARTS - Distributed Aperture Resilient Terminal System - RFI has been published

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- If you cover those bullets, you don't have time to go deep into the MIL-STD deck. But I think this audience will most appreciate the highlights I bulleted.

- worker bees will already be saturated with tech detail from PlugFest exercise
- Leader bees will appreciate the big picture recap
- you're off the hook from deep-diving into WGS Cert performance details we haven't ironed out yet

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- OTHER THOUGHTS: PdM WESS isn't the only Govt agency going after Digital IF