UC San Diego

SatComs Fleet update 2022-Apr-20 (RVOC 2022)

Jon C. Meyer, Information Systems Manager
Scripps Institution of Oceanography, UC San Diego

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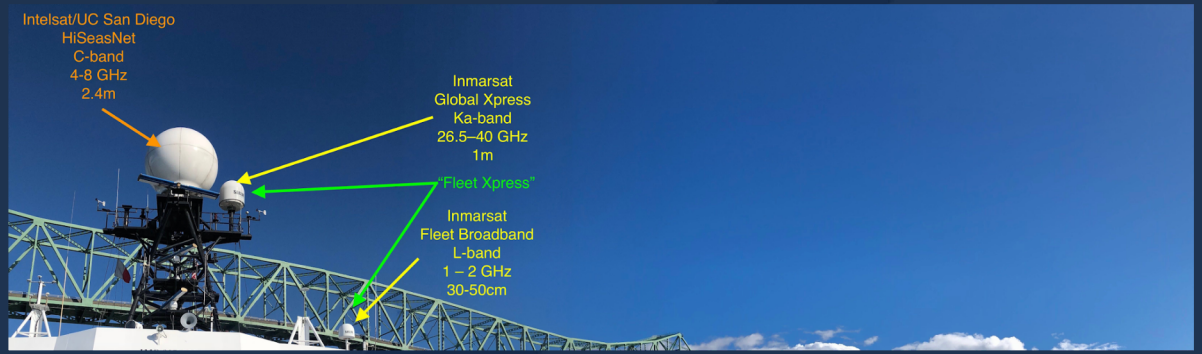
SatComs Fleet update
2022-Apr-20 (RVOC 2022)

Agenda

1. Personnel Changes/Plans
2. Leasing and Day Rates
3. SatComs Frequencies
4. Fleet Hardware
5. Baseline bandwidth boosts
6. Adding CyberGuard to the Marlink contract(s)
7. Other Activity
8. Evolution of Internet Needs

Personnel Changes



- Kevin Walsh retired in June 2021 (though, he remains active on some project around UC San Diego)
- Thomas Lockwood, who had been working on the project since 2019, took over lead technical duties
- Mark Pumphrey has moved departments within UC San Diego and is no longer working for us
- Erik Stevens is joining our team in May 2022
- Lee Ellett, Jon Meyer and Kenneth Olsen continue to work on the project
- Plans are in the works to hire a network engineer to assist with some integration efforts and provide logistical relief to Thomas Lockwood

Leasing and Day Rates

- **2020:** discussion of having ShipOps co-fund seagoing Internet to enhance mutual understanding that Internet is critical for all persons on ship. The split landed on was: Tech Services funds airtime, Ship Ops funds hardware and maintenance
- **2021:** attempt at introducing/using these day rates were uneven
- **2022 and beyond:** Day Rates funds recovery was determined to to be miniscule enough that day rates will no longer be used
- This drives HiSeasNet to an all-leased model for expensive hardware in order to stay current on equipment du jour
- Leasing does seem to help with repair efficacy

SatComs Frequencies

IEEE Frequency Designation	Frequency	Wavelength
L-band	1-2 GHz	30-15 cm
C-band	4-8 GHz	7.5-3.75 cm
Ku-band	12-18 GHz	2.5-1.67 cm
Ka-band	26.5-40 GHz	1.11–0.75 cm

- L-band: Inmarsat Fleet Broadband, Iridium CERTUS (backup/out-of-band/slow)
- C-band and Ku-band: Sealink (high-performance capable)
- C-band and 5G have interferences, making it generally illegal to use in US ports
- Ka-band: Global Xpress (high-performance capable, but more prone to weather-related outage)
- On Ocean/Global class vessels, we run multiple systems to dodge total blockage problems due to weather and or equipment failure
- **Punchline: higher frequency = more performance, but more weather problems**

Fleet Hardware since 2020

- **2020-present:** 19-20 vessels in fleet
- https://hiseasnet.ucsd.edu/vessels/ for up-to-date info
- **64 radomes within ARF**
- **36 high-performance radomes (56%)**
- **28 backup/out-of-band radomes (44%)**
- **55 radomes installed between 2020-2022 (86%)**

Fleet Hardware (cont'd)

- Main models
- Sealink: Intellian v240M
- Global Xpress: Intellian GX100NX HP
- Sealink: Intellian v150NX
- FleetBroadband: Sailor 500
- Iridium CERTUS: Seatel /Intellian C700
- More and more dual dome installs happening for high-performance systems in order to achieve 99% uptime

Fleet Hardware (cont'd)

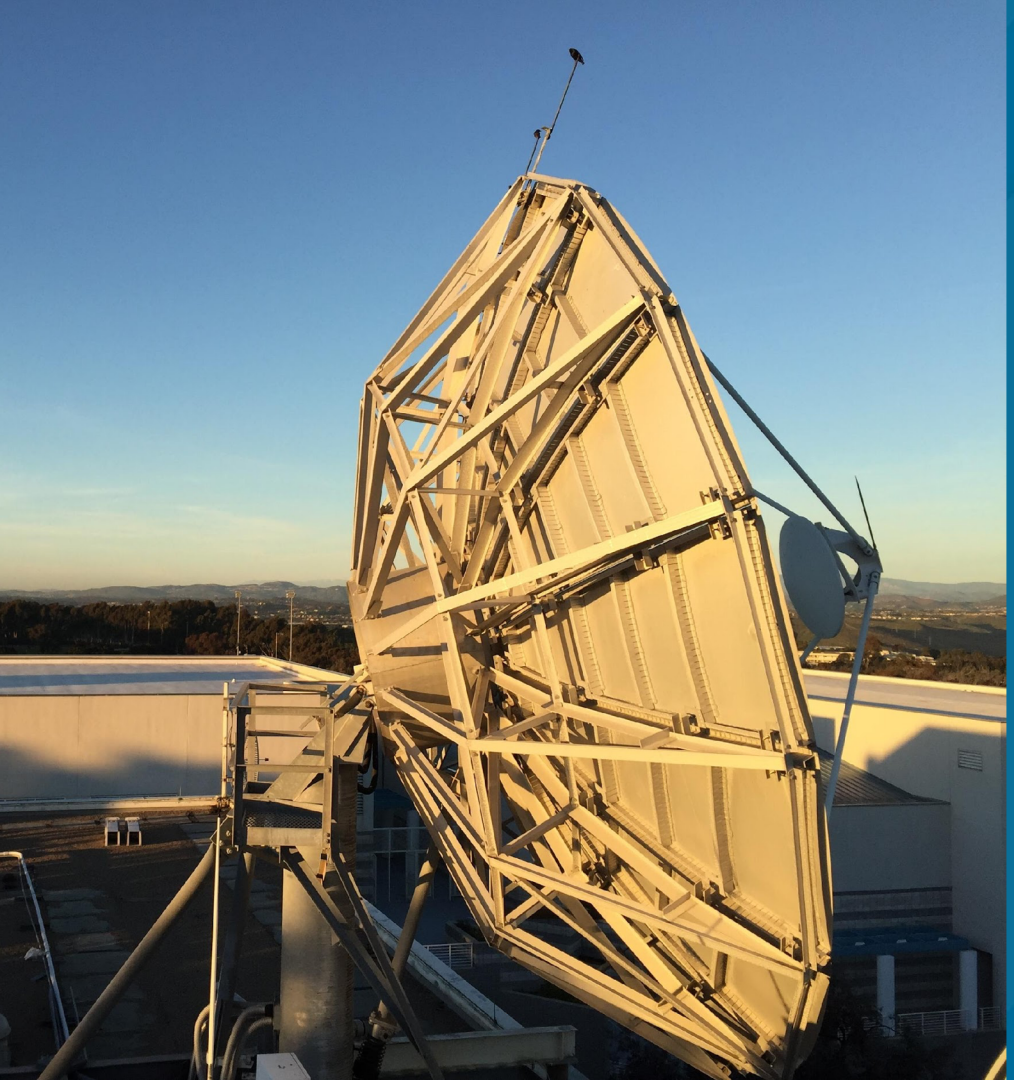
- Highlighted hardware failures…
- May 2021: REVELLE cross-level motor failed; repaired with spares kit, but ship had to come in from a cruise
- 2021-2022: multiple small failures and configuration missteps on THOMPSON made for a months-long path to address stable Internet
- Sep 2021: RIDE bearing failures, ICU failure
- Mar 2022: SIKULIAQ shock mount failures
- Good installs take time! Plan for 1-2 weeks for new installs and multiple weeks of preparation
- Annual maintenance is critical to minimizing failure risks

Baseline Bandwidth Boosts

- Granted approval to increase bandwidth ~400% in October 2021
- The primary goal is to ensure that the ships' Internet link(s) were, at a minimum, capable of supporting Zoom on some level (2 Mbit/s)
- Rollout of increased performance happened between November 2021 and March 2022, based on ships' schedules
- Sealink: 4x2 Mbit/s CIR
- Fleet Xpress: 2x2 Mbit/s

Adding CyberGuard to the Marlink contract(s)

- Monitoring of satellite-based Internet cybersecurity
- Basic version for now, but data will be custom-fed to ResearchSOC for deeper analysis
- Details at https://marlink.com/wp-content/uploads/2020/08/Marlink-CyberGuard-Solutions-Brochure.pdf



Other Activity

- Investigating higher-performance systems using satellites in non-geostationary orbit such as LEO, MEO, but global factors like supply chain and sanctions on Russia have slowed some systems' progress
- Established a partnership with Ocean Exploration Trust (OET), who operate R/V Nautilus. We sponsored them into our Marlink contract so they can save money and we can work together more efficiently.
- Continue to support USAP in similar manner to OET
- Evolving progress on providing input to MFP and ship scheduling regarding Internet coverage

Evolution of Internet Needs

- Internet was put on the ship for Science, but Ship Operators have clear and present operational needs (and IMO responsibilities) for Internet and its security on ship
- Per INSIGHTS INTO VESSEL CONNECTIVITY (Apr 2022)... “According to the International Maritime Organization (IMO), the GMDSS regulations are under review for modernization, in preparation for amendments to be adopted in 2024. Since vessel connectivity is becoming an integrated part of vessel operation and functions, it is foreseeable that new rules and industry standards will evolve to address the various safety and performance requirements on connectivity for data-centric vessel functions. Likewise, there will be an increased focus on remote control centers.”
- Further discussion is needed to normalize expectations for all stakeholders
- Suggest a dedicated meeting with CIWG. Topics to include: OT support (EG ECDIS, medical, vendor VPN, engine systems, winches), wellness network/TV? , dedicated backup path for ship operations?
- Similar to CyberGuard, possible efficiency gains are possible by engaging with HiSeasNet. EG devices such as medical devices could be more easily integrated and maintained with our Internet provider. Another example could be wellness network EG https://marlink.com/solutions/crew-and-worker-welfare/

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THANK YOU!

QUESTIONS?