Next Generation Space Defense

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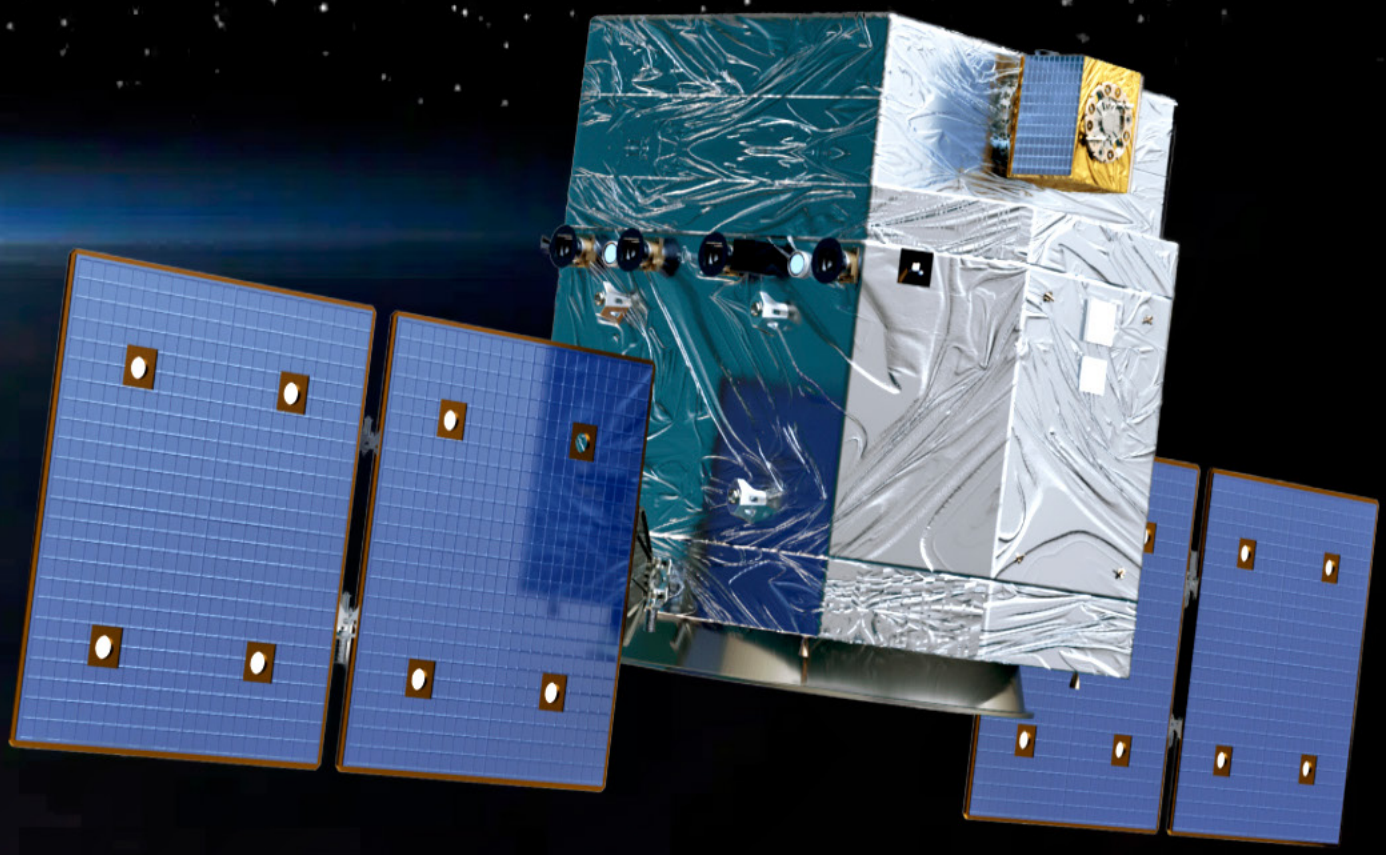

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— SPACE SYSTEMS COMMAND BRIEFING —
ACHIEVING "DECISION DOMINANCE" TO ENABLE GLOBAL JOINT OPERATIONS

SPACE SYSTEMS COMMAND'S UD L PROVIDES DATA SOLUTIONS AT THE SPEED OF BATTLE

Author: Lisa Sodders, Space Systems Command

Joint all domain operations demands the ability to make critical decisions at speed based on accurate and timely data.

The ***U.S. Space Force*** has a wealth of space-based data that goes back as far as the earliest days of space exploration, with new, critical information gathered every second. However,t data isn't helpful if it's siloed, can't be interpreted quickly, or shared with other military services and allies.

That's why ***Space Systems Command*** (**SSC**) is working to make that data more accessible, at the speed of relevance and over resilient systems that can withstand attack from adversaries.

The ***Unified Data Library*** (**UDL**) is the Cloud-based data repository that hosts a wide range of data, including data for *space domain awareness (*SDA*)*.

The UDL contains more than 300 different data types in addition to commercially acquired data, enabling the Space Force, government and allied partners access to a multitude of data sources from a centralized repository.

"The UDL empowers us to harness the power of data, from more sources, in less time, enabling users to collaborate and analyze data in different ways," said ***Lt. Col. Dan Kimmich,*** Materiel Leader, Cross Mission Data at SSC*. "This leads to better, faster decision making and for multi-domain operations, it helps create a more complete picture of any exercise or battlespace."*

Lt. Col. Dan Kimmich

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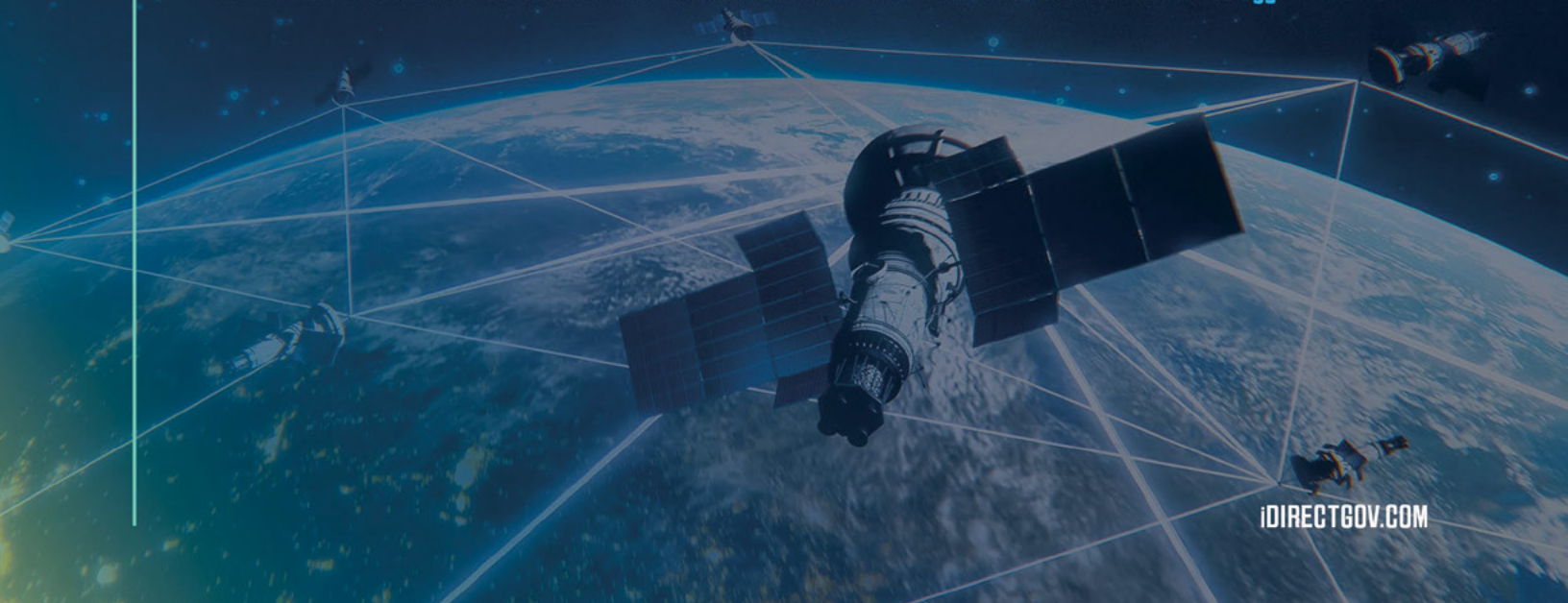

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The UDL is one of the many data solutions that improve accessibility, management, and use of data offered by the ***Cross Mission Data*** branch, under the ***Battle Management Command, Control and Communications*** (**BMC3**) program executive office at SSC.

Cross Mission Data's mission is to provide data as a strategic asset to the Space Force, ***Department of Defense*** (**DoD**), and allies to enable command and control at the speed of battle.

"The UDL is just one of the many ways SSC is leveraging cutting-edge technology to deliver speed to the joint all-domain fight," said SSC's Shannon Pallone, program executive offer for BMC3, a $4 billion portfolio of more than 13 programs and 31 sub-applications / projects encompassing a wide-range of mission areas, including enterprise ground services, information mobility, command and control, cross mission data, and data transport.

"Space-based assets and the C3 systems that provide access to these assets enable us to detect threats, deter aggression, and protect our way of life," Pallone said. *"The faster we can process this information, compare it with data from our allies, and deliver it to our warfighters when they need it, the stronger our nation will be."*

The UDL includes vast amounts of space data, ranging from launch notifications, track and positional data, conjunction assessments (*when two residents space objects pass within a certain number of kilometers of each other*), maneuvering messages, and the catalog of space objects collected by the ***18th Space Defense Squadron***.

In fact, the Space Force has every metric observation (*the distance between two objects in space*) since the 1950s.

"Prior to 2019, components that now make up the Space Force were spread out across the U.S. Department of Defense, and the focus was on catalog maintenance – maintaining an accurate list of space objects – everything from space debris to space vehicles and celestial bodies. However, this is rapidly expanding with the escalating amount of space activity as well as adversarial threats in this domain making Space Domain Awareness take on a new urgency," Kimmich said.

"If we send a Space Domain Awareness sensor to look at a particular object and we don't discover that object, but something in close proximity to that, we continue to track that object and work to identify what it is, because the object may have maneuvered or there may be a secondary object now in the frame," Kimmich said.

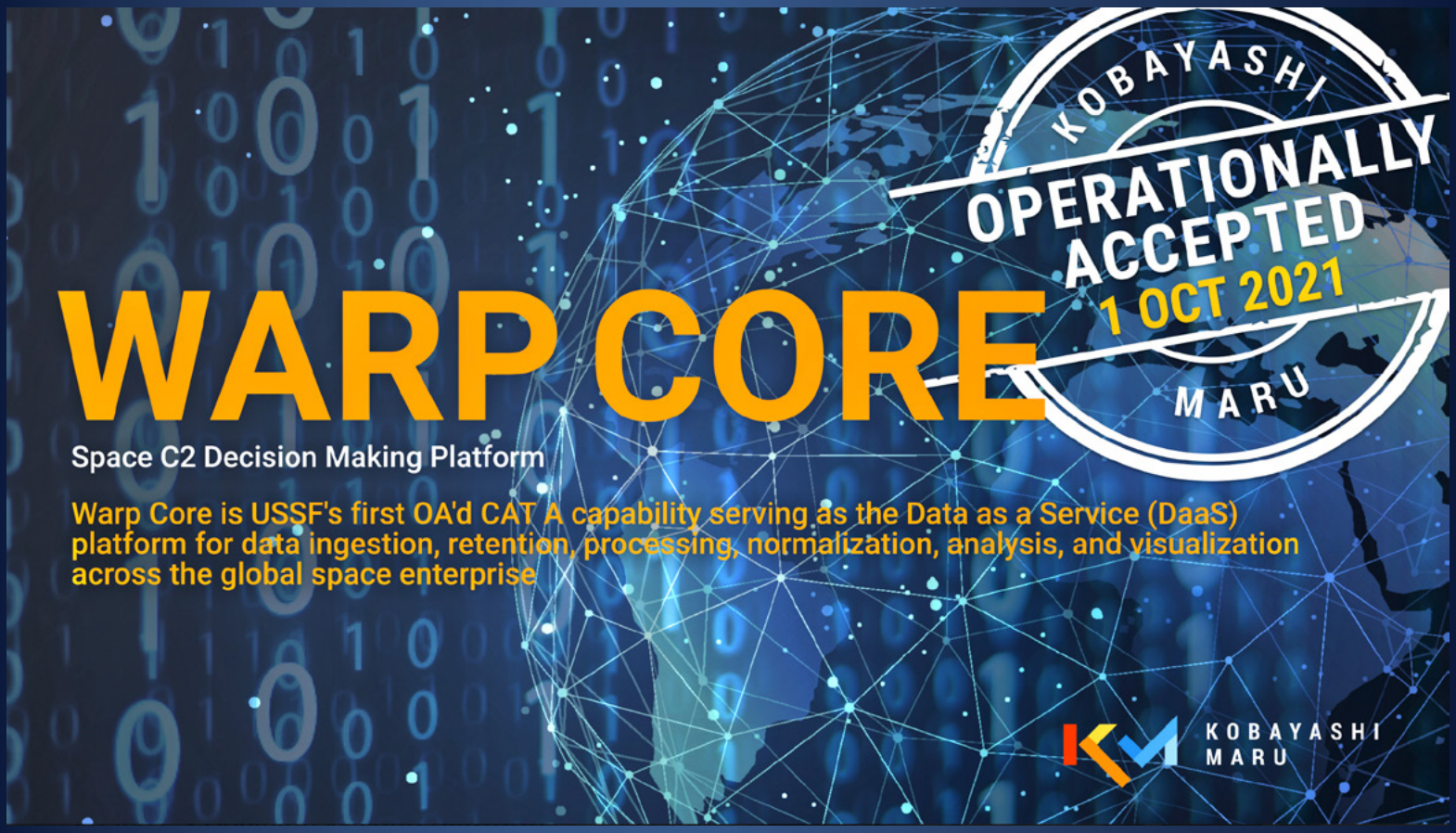
"Collecting all of this information enhances the ability to tip and cue sensor networks around the globe and alert leaders that we've now seen something we didn't expect," Kimmich continued. "This awareness accelerates our ability to close kill chains and get critical information where it needs to go, from an operational level but also the tactical level so decision makers are able to take action quickly."

The UDL itself was launched only as recently as 2018, as a pilot project by the ***Air Force Research Library***, and SSC's Air Force predecessor organization. It was mainly seen as a platform to control data the Space Force purchased from commercial vendors, and make sure only those who had a need to access that data could do so.

However, it soon demonstrated utility beyond this initial purpose, demonstrating the importance how properly curated data also results in information that can be trusted and implemented quickly to support operations.

One of the UDL's earliest examples was in aiding ***Operation Allies Refuge***, the evacuation from Afghanistan effort in 2021, led by Air Mobility Command under the U.S. Air Force.

Multiple data sets related to aircraft, mission status, mobility, logistics, personnel, and supply-chain data from a wide range of sources across the DoD and other government agencies were integrated into the UDL.



Warp Core, an SSC platform that provides data analytics and visualization tools, ingested, consolidated, curated, and fused the data provided from the UDL, with data collected from other sources across the government to deliver an authoritative picture of events in a dynamically changing environment.

"Everyone who was connected to the UDL started receiving that information as soon as it was published," Kimmich said. *"The Secretary of Defense, Air Mobility Command, the FBI, Homeland Security. Because we broke down data silos across all of these different organizations, we were able to expose to a variety of different agencies and consumers. When you break down silos, you get away from all these single points of integration but also the aggregate data received from these silos together forms a whole far greater than sum of its parts."*

During ***Operation Allies Welcome,*** the UDL again helped correlate passenger records for the relocation, in-processing, and resettlement of Afghan refugees in the United States. More recently, during last summer's ***Operation Resolute Sentinel (RS) 23***, a ***U.S. Southern Command*** (**SOUTHCOM**) global exercise, held in Lima, Peru, the UDL team augmented the ***Joint Commercial Operations*** (**JCO**) cell to support the ***Surveillance, Reconnaissance, Tracking*** (**SRT**) Initiative.

Peruvian Coast Guard members prepare for training with the U.S. Coast Guard Maritime Safety and Security Team (MSST) 91101 (Seattle), at Base Naval del Callao, Peru, July 4, 2023 during exercise Resolute Sentinel 23. Resolute Sentinel improves readiness of U.S. and partner nation military and interagency personnel through joint defense interoperability training, engineering projects and knowledge exchanges.

Resolute Sentinel is a SOUTHCOM exercise that provides joint training and improved readiness of U.S. and partner nations. The JCO is a U.S. Space Force led initiative that uses commercial providers to deliver diverse, timely SDA capabilities to the U.S. and allies.

"The UDL serves as the foundation for exposing data to our JCO and is an incredible opportunity for us to build our operational concept of how we would fight in alliance with our allies," said Kimmich.

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Resolute Sentinel 23 Combined Joint Task Force senior leaders conduct a tour at the Centro Nacional de Operaciones de Imágenes Satelitales, Peru, July 4, 2023. The space exercise, led by U.S. Southern Command in partnership with U.S. Space Command's Joint Task Force Space Defense Commercial Operations (JCO) Cell, the Peruvian Aerospace Research and Development Center (CONIDA), and the Peruvian Air Force, aims to bolster the region's emerging space program.

During this exercise, the JCO team was able to leverage commercial data accessed from the UDL's Global Data Marketplace to identify and geo-locate a vessel suspected of illegally fishing in Peruvian waters, as well as imaging a volcano that showed signs of an impending eruption in Columbia. This event further demonstrated how UDL capabilities can be used in worldwide joint operations.

Several portions of the UDL have been operationally accepted — which is achieved when the operations community has formally accepted a capability from the acquisition community to execute their mission.

> *"We've taken it through a prototyping phase and we're now entering the software acquisition pathway to make it a reportable program through SAF SQ (Secretary of the Air Force for Space Acquisition and Integration,)"* Kimmich said. *"We're working with the operational community to build the capability needs statement, which will reflect what our squadrons and deltas will need from the ULD to serve them as an operational system."*

In the meantime, upgrades continue to be made to the system, further enhancing it, and increasing its effectiveness and its resiliency. This includes providing iterations of the system to operate in a disrupted, disconnected, and intermittent and low-bandwidth environment during times of conflict, Kimmich said

To be able to operate under these conditions, the Cross Mission Data team created the Tactical UDL, a 45-pound instance of the Enterprise UDL that can be connected to the operational system of an aircraft allowing warfighters to access and manipulate critical mission data in real time.

> *"Speed, location, fuel, armament all passes through that data bus, but warfighters able to tailor what information they want to store locally so in the event they're not able to sync with the UDL on CONUS (Continental United States) if they're forced to not broadcast for security purposes, that information is stored on board,"* Kimmich said.

> *"It could be flight plans, it could be mission operations – it's connected to their on-board satellite communications, and if that is not available, the system can also access 5G, and then we can add another antenna to access Starlink and eventually Starshield communications from the Department of Defense, when it's accessible."*

> *"We have visions of establishing these mini UDLs next to our ground-based SDA sensors so that if our sensors themselves get disconnected, they've got an on-board catalog they can use to continue tracking objects, continue publishing that information to the onboard UDL, and then, when it's resynchronized, directly share that back to the enterprise UDL and make it available,"* Kimmich said.

To further expand data solutions on a global scale, Cross Mission data is working on incorporating ***artificial intelligence*** (**AI**) and ***machine learning*** (**ML**) with data in the UDL to increase the speed of decision-making and facilitate data sharing with allies through the ***Allied eXchange Environment*** (**AXE**).

The AXE, which won SSC's second annual "***Fight Tonight***" innovation competition in November of 2023, is a standardized interface that facilitates secret-level data sharing with international partners. Data provides the foundation to enabling AI/ML, providing a secure repository of data. Therefore, holding an endless supply of data from a multitude trusted sources from around the globe creates limitless possibilities for AI/ML to be used for national security purposes.

> *"There hasn't been a means by which we can machine-to-machine share data with our allies,"* Kimmich said. *"We have systems that enable email exchanges, we have systems that enable calls, but we've never gotten to the point where in real time – seconds to minutes, not hours -we're able to share data between nations."*

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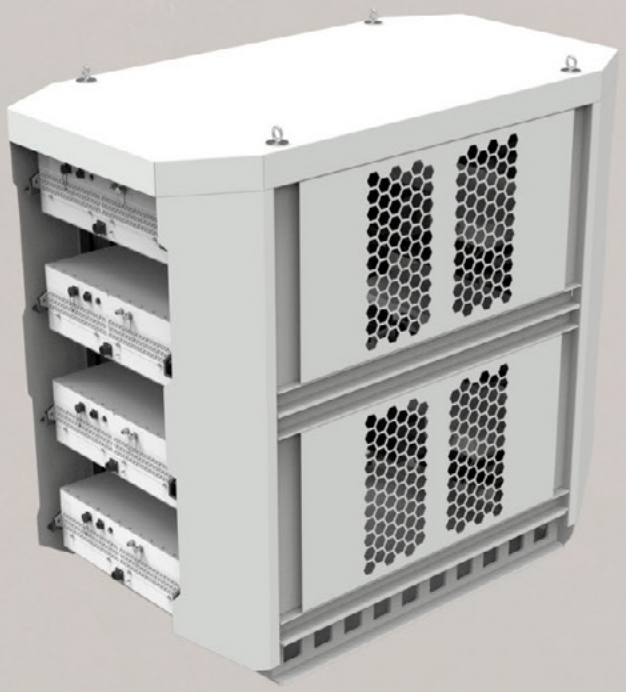


"AXE is attempting to do that – basically be a landing point for data coming in from our allies – it will sync with our U.S. database and allow that information to flow seamlessly machine to machine, based on how it's classified, and will get us to a point where we can in real time share that information which is critical to how we intend to fight in space, going forward," Kimmich said, adding, *"As our adversaries continue to advance their space and anti-satellite capabilities, we need to rely on data collected from sensors across the globe from our allies to make sure we're detecting and maintaining custody of these space objects."*

"This is done completely at the unclassified level, but with the sensors that are provided across the globe, we are able to maintain (visual) custody of objects, do live training, and put into practice new techniques and procedures, working with our allies," Kimmich said. *"It removes the classification barrier and actually allows us to 'Fight Tonight' with our allies."*

To further expand accessibility, Cross Mission Data also is working through multi-level security challenges, seeking to balance ease of use while still protecting classified information. Much of U.S. military information is restricted and can't be shared widely just as other nations have restrictions on their data.

In 2024, the Cross Mission Data team plans to make ***OPIR*** (**Overhead Persistent Infrared**) data accessible in the UDL. With strategic competitors continuing to advance their missile capabilities, the ability to collect and share data from wide range of OPIR sensors across the globe is paramount to maximize our ability to better track ballistic and hypersonic missile threats.

This is especially critical as we look to expand and diversify our missile warning and tracking architecture across different sensors, systems, and organizations to strengthen resilience.

"This is one of the pieces to closing kill chains," Kimmich said. "We've got to make sure we are tracking any new foreign launch and providing that positional and tracking data out to the enterprise."

Upgrading the ***Correlation, Analysis and Verification of Emphemerides Network***, (**CAVEnet**), which supports the 18th SDS' Space Domain Awareness mission, is essential to advancing this effort.

CAVEnet is a legacy system that was used by the Joint Space Operations Center consisting of early 1990s-era workstations and servers. It is an off-line mission support system used for several space surveillance tasks and in-depth analysis that needs to be modernized.

CAVEnet is also responsible for updating and maintaining the ***high accuracy catalog*** (**HAC**), which contains ***special perturbations*** (**SP**) state vectors (*essentially position and velocity*) on all objects, currently tracked by the U.S. military.

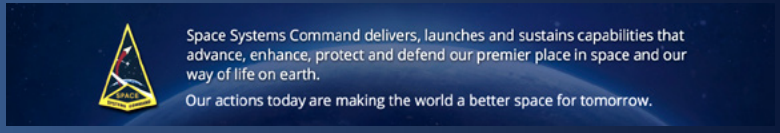
"The intent is not to rewrite any of the scripts (coding that allows you to control a program) – at last count, I think there were 1,600 of them – but simply to port those over to a modern infrastructure," Kimmich said. *"It's run out of storage – right now, they're burning disks and taking data off that and storing it elsewhere. This is the modernization of that platform, and then we'll iterate it and improve it."*

Initial modernization efforts by the Cross Mission Data team in October of 2023 stabilized CAVEnet, mitigating the risk of a critical failure and also expanded its capacity, resulting in an 80 percent reduction in processing time, Kimmich said.

"With each new iteration of the UDL, we're discovering more and more ways to harness both space-based and ground-based data to give our warfighters and our allies the tools they need to win," Kimmich said. *"Our amazing team of military, civilians and contractors are working tirelessly with our partners to advance the future of space."*

Space Systems Command is the U.S. Space Force's field command responsible for acquiring, developing, and delivering resilient capabilities to protect our nation's strategic advantage in, from, and to space. SSC manages a $15.6 billion space acquisition budget for the Department of Defense and works in partnership with joint forces, industry, government agencies, academic and allied organizations to outpace emerging threats.

Contact Space Systems Command at ***SSC@spaceforce.mil*** *follow on* ***LinkedIn****.*



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THE INTRICASIES OF SOFTWARE-DEFINED RADIOS IN SHAPING GROUND SYSTEMS + NETWORKS

Author: Brandon Malatest, Chief Operating Officer, Per Vices

In the ever-evolving domain of modern communication, ground systems and networks are experiencing a paradigm shift, driven by the fusion of Software Defined Radios (SDRs) and high-performance Field-Programmable Gate Arrays (FPGAs).

These sophisticated communication devices operate on a paradigm where radio functionality is defined and redefined dynamically through software updates. As we delve into the multifaceted nature of SDRs, it's crucial to understand their pivotal role in reshaping ground systems and networks.

SDRs represent a shift from traditional hardware-centric radio systems to software-driven, adaptable solutions, offering unparalleled flexibility and capabilities in various domains. This article delves into the intricacies of this transformative alliance, exploring the extended capabilities of SDRs and the additional benefits brought forth by the incorporation of high-performance FPGAs. Together, they redefine the landscape of ground systems and networks, offering unparalleled flexibility and performance.

SOFTWARE DEFINED RADIOS (SDRS)

Software Defined Radios (SDRs) represent a revolutionary advancement in radio communication technology. Unlike traditional radios that rely on fixed hardware configurations for specific frequency bands, SDRs are characterized by their dynamic adaptability.

The core innovation lies in the software-controlled functionality, allowing users to reconfigure the radio's operating parameters through software updates. This flexibility enables SDRs to operate across a wide range of frequencies and standards, making them exceptionally versatile in various applications such as military communication, emergency response systems, terrestrial radio, and satellite communication.

SDRs bring unprecedented adaptability and efficiency to the field of radio communication, serving as a bridge between the traditional hardware-centric approach and the evolving demands of modern communication systems.

OVERALL USAGE IN SATELLITE GROUND SYSTEMS:

The architecture of a satellite ground station is a meticulously designed framework that plays a pivotal role in establishing communication with satellites in orbit. Typically composed of antennas, receivers, demodulators, and control systems, a ground station serves as the vital interface between terrestrial networks and orbiting satellites.

In this architecture, SDRs seamlessly integrate as a transformative component. SDRs, characterized by their ability to dynamically modify radio functions through software updates, are strategically positioned within the ground station's architecture. Their adaptability allows for dynamic tuning across various frequency bands, ensuring compatibility with diverse satellite communication protocols.

SDRs enhance the station's flexibility by enabling real-time adjustments to accommodate different satellite missions, optimizing signal reception and processing. Moreover, SDRs often find application in high-performance tasks such as channelization and signal processing, ensuring that the ground station can efficiently handle the complexities of modern satellite communication within its architectural framework.

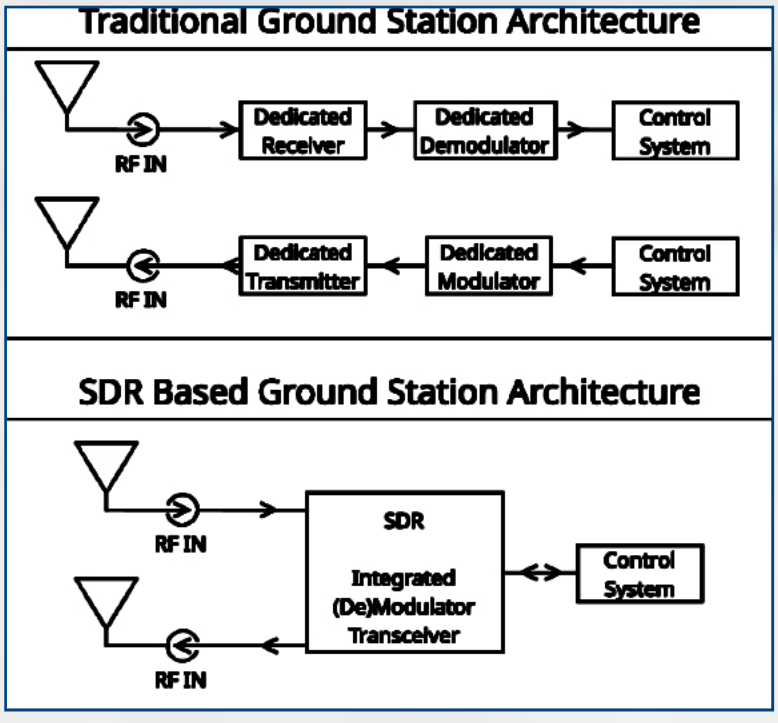

Figure 1: Comparing Traditional and SDR Based Ground Station Architectures. Source: Per Vices Corporation

EXTENDED + FLEXIBLE TUNING RANGE

At the nucleus of SDRs lies their extended and flexible tuning range, a distinctive departure from the rigid hardware configurations of traditional radios. The dynamic nature of SDRs allows them to adapt seamlessly to a spectrum of frequency bands through software programming.

This adaptability is particularly vital in scenarios requiring dynamic frequency allocation, such as military operations, satellite communications, and disaster response efforts. SDRs empower ground systems with the agility to navigate diverse and evolving communication environments effortlessly, ushering in a new era of adaptability. (***See Figure 2***)

HIGH CHANNEL RFE (RADIO FRONT END):

Delving into the intricacies of SDRs, their high channel Radio Front End (RFE) capabilities emerge as a cornerstone in signal reception, filtering, and initial processing. This feature empowers SDRs to process multiple signals concurrently, optimizing spectrum utilization and bolstering communication reliability. The significance of high channel RFEs becomes pronounced in environments saturated with diverse signals, where traditional radios might falter.

SDR equipped ground systems, fortified with high channel RFE, navigate complex signal landscapes with finesse, finding applications in urban communication networks and military operations.

Further elevating the capabilities of SDRs is their support for multiple ***Digital Signal Processing*** (**DSP**) channels per RFE. The integration of high-performance FPGAs introduces an added dimension to the capabilities of SDRs enabling advanced

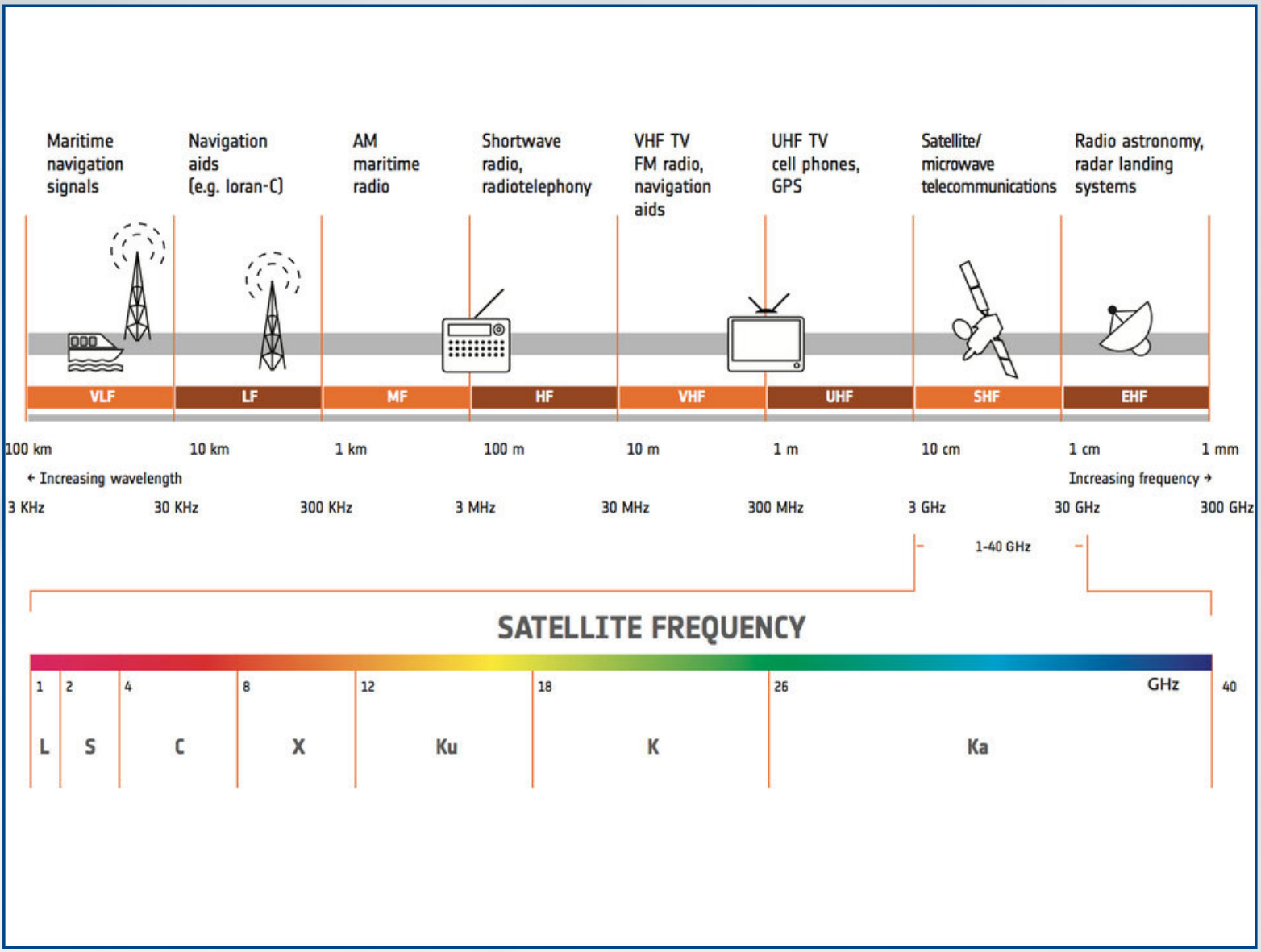

Figure 2: Spectrum of Satellite Communication Bands
Source: European Space Agency (ESA)

channelization, gain, and other forms of DSP within the bandwidth of each RFE.

The FPGA-based channelization elevates the high channel RFE capabilities of SDRs, making ground systems adept at managing crowded frequency spectrums and ensuring reliable communication in challenging environments. The DSP further encompasses intricate tasks such as modulation, demodulation, filtering, and error correction.

The ability of SDRs to concurrently support multiple DSP channels within a single RFE not only facilitates parallelized and accelerated signal processing tasks but also augments overall system performance. This capability is particularly advantageous in scenarios necessitating high data throughput, as observed in broadband communication and data-intensive applications.

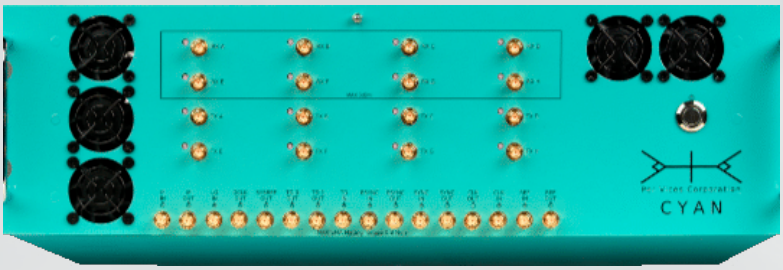

Figure 3: Example of High Channel Count SDR (Cyan)
Source: Per Vices Corporation

HIGH RF BANDWIDTHS

A defining feature of SDRs lies in their capacity to support high ***Radio Frequency*** (**RF**) bandwidths. This capability assumes paramount significance in applications such as satellite communication, where the amount of data is extensive as it traverses considerable distances.

SDR equipped ground systems, with their advanced hardware and software architecture, ensure reliable and high-throughput communication even in challenging environments. The high RF bandwidths offered by SDRs pave the way for enhanced data rates, contributing to the efficiency of communication networks.

HIGH DIGITAL THROUGHPUT — 4X100GIGE

The pinnacle of digital throughput capabilities is achieved through the seamless integration of SDRs with high-performance FPGAs offering interfaces like 4x100GigE. This combination not only facilitates data transfer rates of up to 400 gigabits per second but also harnesses FPGA capabilities to streamline and optimize data processing, ensuring real-time efficiency.

In applications demanding swift and reliable data transfer, such as surveillance systems and SATCOM, this integrated approach positions ground systems at the forefront of communications.

CHALLENGES + CONSIDERATIONS

In the pursuit of these myriad advantages, it is imperative to acknowledge and address the challenges associated with the implementation of SDRs. Within the industry, the greatest concern has been the heightened vulnerability to cyber threats, given the reliance on software-driven programmable elements. There have however been significant advancements in the integration and implementation of SDRs which include robust cybersecurity measures to safeguard ground systems against potential breaches.

Secondly, the inherent complexity of many SDRs sometimes necessitates specialized knowledge for integration, configuration and maintenance, underscoring the importance of manufacturers offering either comprehensive training programs or integration support to harness the full potential of SDR equipped ground systems.

In conclusion, the convergence of Software Defined Radios and high-performance FPGAs unfolds a new era in ground systems and networks. Their extended tuning range, high channel count with channelization capabilities supporting multiple DSP channels per RFE, and optimization of high RF bandwidths collectively redefine the landscape of modern communication.

As ground systems evolve to meet the demands of an interconnected world, the collaborative potential of SDRs and high-performance FPGAs promises not only unparalleled flexibility but also a performance benchmark that sets the stage for advanced communication systems.

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Brandon Malatest

Author Brandon Malatest is the COO and Co-Founder of Per Vices Corporation, a leader in Software Defined Radio technology. Brandon has an honour's degree in Physics with a specialization in Experimental Physics from the University of Waterloo in Ontario, Canada.

Per Vices Corporation

The company produces software defined radios, offering the highest channel count and bandwidth SDRs for the satellite ground station market. The high performance radios with exceptional signal processing capabilities, DSP resources, and advanced hardware features enables customers to leverage Per Vices SDRs to achieve superior performance, enhanced flexibility, and future-proof solutions. Contact ***solutions@pervices.com*** *to learn more about the different options available.*

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DISPATCHES

Viasat's 1st U.S.N. Military Sealift Command ship installation

***Viasat, Inc.** (NASDAQ: VSAT) has completed the first ship installation for the **U.S. Navy Military Sealift Command** (MSC) under the Next Generation Wideband (NGW) Follow-On (FO) 10-year, Indefinite Delivery/Indefinite Quantity (IDIQ) **contract awarded** to **Inmarsat Government** by the **Defense Information Systems Agency** (DISA) on June 30, 2022.*

Under the contract, the company maintains and operates commercial communications infrastructure, which includes satellite systems, teleport services and terrestrial services. Inmarsat Government is now part of Viasat's government business, following Viasat's acquisition of Inmarsat on May 30, 2023.

This first installation of 105 ships demonstrates the company's ability to deliver a robust, reliable global managed satellite communications (SATCOM) solution. The company upgraded the MSC ship's primary afloat network from Ku-band to the ***Global Xpress*** (GX) Ka-band system and ***ELERA Enhanced L-band Maritime Antenna*** (ELMA), a variant of the award-winning, ***LAISR*** L-band solution to provide communications on the move via a small-size, high throughput terminal.

The hybrid solution of Ka- and L-band service ensures that the MSC ships have secure, resilient, worldwide communications capabilities, as well as a reliable global, on-demand backup network. This approach is designed to provide significant enhancements over legacy Ku-band by providing higher and scalable data rates on ships' primary and back-up systems, and uniform coverage across the GX and ***ELERA*** networks.

Additionally, by delivering the primary and secondary SATCOM capabilities in a holistic, managed service model that includes satellites, ground networks and type-approved terminals – SATCOM as a Service.

Photo from the General Dynamics National Steel and Shipbuilding Company (NASSCO) Builder's Trial of USNS John Lewis (T-AO 205), the Navy's lead ship of its new class of fleet replenishment oilers. Builder's Trials consist of a series of in-port and at-sea demonstrations that allow the Navy and the shipbuilder to assess the ship's systems and readiness prior to acceptance trials and delivery to the Navy. (Courtesy photo by General Dynamics NASSCO)

The MSC fleet benefits from an integrated, worldwide solution that delivers high throughput with ***RF*** (**Radio Frequency**) band and path diversity to ships at sea. All of the network aspects are designed as a single solution and for mobility, so users experience a reliable, on-demand continuous service.

*"As the premier maritime logistics provider for the U.S. Department of Defense, the Military Sealift Command plays a critical role in our nation's defense. Our ships must have resilient communications capabilities that deliver consistent performance and can be relied upon regardless of location or weather conditions," said **Eliot J. Skinner, Deputy Command Information Officer**. "These upgrades ensure that our Mariners can confidently operate anywhere in the world knowing they have a reliable, redundant communications network supporting them."*

*"We have reliably served the U.S. Navy Military Sealift Command for more than 10 years, and we are proud to continue supporting its operations around the world," said **Steve Gizinski, Managing Director, Viasat Government Services**. "These upgrades provide the MSC fleet with significant enhancements in SATCOM capabilities, including expanded global coverage, improved reliability and resiliency, and the on-demand data rates that meet user needs."*

DISPATCHES

J.F. Lehman & Company completes their acquisition of Mission Microwave

J.F. Lehman & Company ("JFLCO"), a leading, middle-market, private equity firm that is focused exclusively on the defense, aerospace, maritime, government and environmental sectors, has announced that an investment affiliate has acquired ***Mission Microwave Technologies, LLC***.

Founded in 2014 and headquartered in Cypress, California, Mission is a leading provider of Solid-State Power Amplifiers (SSPAs) and Block Upconverters (BUCs) to the SATCOM market. The Company's X-, Ku- and Ka-band units support critical ground-based, airborne, maritime and space-based applications for government and commercial customers that require high efficiency, reliability and performance. Using advanced gallium nitride (GaN) transistors, unique power combining technology and novel full-system designs, Mission provides the industry's most efficient, lightweight, and compact high-power devices.and Washington, D.C. ***More info..***.

DISPATCHES

CopaSAT releases their STORM V3 SATCOM terminal

CopaSAT's STORM V3 is easy to deploy with auto-provisioning and no commissioning required anywhere in the world with a service plan and attaches to vehicles and vessels via standard mounting systems.

STORM V3 provides flexible connectivity via a mobile hotspot that can use SD-WAN to select between cellular, Wi-Fi, or satellite networks for optimization, failover, or balancing.

"As the demand for resilient, low-latency satellite communication solutions intensifies, CopaSAT has designed the STORM V3 terminal that integrates state-of-the-art technology including the Starlink and Starshield antenna systems. This transformative system leverages low-latency LEO constellations that are setting new benchmarks for reliable SATCOMs-on-the-Move (COTM) and Communications-on-the-Pause (COTP) connectivity. Designed with precision and rigor, the STORM V3 terminal is currently undergoing testing to MIL-STD-810H standards, ensuring durability and reliability in even the most demanding environments. This milestone underscores our unwavering commitment to innovation and excellence, as we strive to provide our customers with unmatched performance and connectivity solutions that transcend boundaries and elevate possibilities," Charlie Daniels, Business Development Director, CopaSAT

Orbit's multi-purpose SATCOM terminals for armored vehicles intro'd

***Orbit Communications Systems** has unveiled the company's Line-of-Sight (LOS) Multi-Purpose Terminals (MPT) for MILSATCOM for armored land platforms of all sizes.*

Orbit's line of Multi-Purpose Terminals, including the ***MPT-30 and MPT-46***, redefine mobile communication with unparalleled reliability and speed. Designed with versatility in mind, these compact, yet powerful, terminals can be installed on a variety of mobile platforms, from armored vehicles to ATVs, ensuring seamless broadband connectivity in even the most challenging terrains.

Their low ***size, weight, and power consumption*** (**SWaP**) design offers high performance — over 126 Mbps for downloads and up to 29 Mbps for uploads. This ensures that high-volume data, including live video streams, can be transmitted without interruption, a critical factor for mission success.

Moreover, the terminals are built for the future, supporting a wide range of satellite orbits — Low Earth Orbit (LEO), Medium Earth Orbit (MEO), Geostationary Orbit (GEO), and Highly Elliptical Orbit (HEO)—and are compatible with both Ku- or Ka-bands. By catering to the diverse needs of modern military operations, they enable forces to maintain critical communication lines, enhancing situational awareness and operational effectiveness across a spectrum of environments.

The terminals comply with MIL-STD and Civil standards as well as with International, national and satellite SATCOM regulations. They are compatible with military satellite systems, making them an ideal choice for Intelligence, Reconnaissance, and Surveillance (ISR) applications, which require highly accurate tracking capabilities, as well as meeting the 'everywhere, all-the-time' coverage requirements of military users.

*"We are proud to further extend our MPT family and offer its high-performance proven capabilities to military vehicles of all sizes," said **Dany Eshchar, CEO of Orbit Communications Systems**. " Orbit's MPT systems have been deployed on various mobile platforms around the world and now can provide "anywhere, anytime' communications to the forces in the field and ensure successful completion of complex missions such as border protection, ISTAR missions, and more."*

About Orbit communication Systems

Orbit Communication Systems Ltd., a global leader in the field of airborne communications, satellite tracking, maritime services, ground-station technology, and cutting-edge solutions for the new space era, is revolutionizing the way we connect with the world. Our state-of-the-art systems are found on an extensive range of platforms, from mission aircraft and trainers to rotary-wing aircraft, transport vessels, tankers, and jet fighters. We also extend our reach to cruise ships, naval vessels, ground stations, and offshore platforms. The company delivers cost-effective, and highly reliable solutions to commercial operators, major air forces and navies, space agencies and emerging New Space companies.

DISPATCHES

Gilat awarded million$$ follow-on order from the U.S. DoD

Gilat Satellite Networks Ltd. ***(Nasdaq: GILT, TASE: GILT) recently revealed that the U.S. Department of Defense (DoD) awarded a $10 million follow-on order to one of the company's U.S.-based subsidiaries, DataPath.***

This additional order is for ***DKET 3421 terminals***, transportable SATCOM hubs that deliver the operational flexibility, capacity, connectivity, and control required to ensure success anywhere in the world.

The field-proven DKET 3421 terminal supports multi-carrier operations with a scalable modem architecture (up to 32 modems) while weighing under 5000 lbs. to allow for easy transport over air, land, or sea via a variety of aircraft and vehicles.

Deploying in less than three hours, the DKET 3421 provides a satellite network hub in the form of a single-skid with the flexibility to leverage available satellite assets.

"Our solutions are specifically tailored to meet the strict requirements of government and military operations. We take great pride in our unwavering dedication to meeting and exceeding the expectations of our customers, and our team works tirelessly to provide innovative solutions to their mission-critical requirements," said ***Barry W. Botts, Vice President, Sales and Business Development for DataPath.*** *"This follow-on order is a testament to the outstanding performance and satisfaction our solutions consistently deliver."*

DISPATCHES

Umbra unveils bistatic SAR data from the firm's tandem pair of smallsats

***Umbra** has announced the forthcoming release of imagery from the firm's tandem pair of Synthetic Aperture Radar (SAR) smallsats.*

Umbra is set to provide customers with bistatic SAR data later in 2024. The monumental launch of Umbra's first tandem pair of satellites, ***Umbra-07*** and ***Umbra-08***, aboard the **SpaceX Transporter-9** mission on November 9, 2023, marked a significant leap in SAR imaging.

With eight satellites currently on-orbit, Umbra plans to deploy the remaining satellites in its licensed, 32-satellite constellation in strategically designed pairs. Operating satellites in a cluster formation facilitates multi-static collection and other integrated operations, offering distinctive phenomenology and inherent resilience.

This innovative approach opens the door to various applications, including ***Intelligence Surveillance Recognizance*** (ISR) capability, elevation modeling, imaging resilience, and the implementation of moving target indication techniques.

Umbra's development of the technology necessary to automate formation flying and multi-static data processing has been dramatically accelerated by the ***Defense Advanced Research Projects Agency*** (**DARPA**) over the past year, which selected the company as a partner for its **Distributed Radar Image Formation Technology** program.

With the unique ability to capture images at day/night, all-weather capable, Umbra's SAR satellites are indispensable for monitoring change. Umbra's high-performance SAR satellites deliver the highest quality SAR data at unprecedented volumes and area density, enabling the U.S. Government, its allies, and commercial partners with actionable, all-weather insights.

***Jason Mallare, Vice President, Global Solutions**, said, "The ability to operate spacecraft in coherent pairs is an important step in unlocking the novel promises of cluster operations. The scaling up from one to many, with highly affordable individual satellites, enables clustered flight with the potential for proliferation of truly resilient systems that offer tremendous traditional and full spectrum capabilities."*

About Umbra

Umbra is a vertically integrated space technology company that offers intelligence data as a service to commercial and government customers. Our cutting-edge products help customers solve complex business, environmental, and security challenges. Umbra is founded, funded, built, and operated in the USA with headquarters in Santa Barbara, California, and has a presence in Austin, Texas, and Washington, D.C.

DISPATCHES

Kratos receives million$$ in awards for C-UAS + Air Defense System

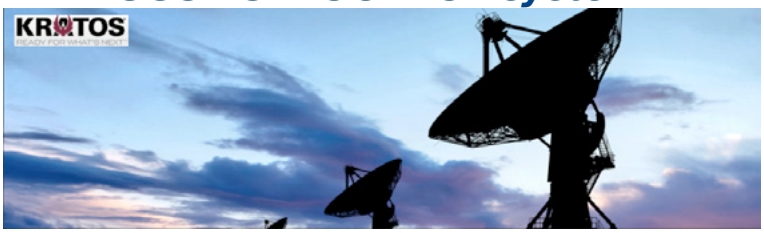
Earlier this year, Kratos Defense & Security Solutions, Inc. (Nasdaq: KTOS) received approximately $50 million in awards for Products and Hardware, including for and in support of Counter Unmanned Aerial System (C-UAS), Air Defense and Radar Systems.

The $50 million total includes contracts and programs that were awarded to Kratos on a single award or sole source basis. Kratos is an industry leader in systems, hardware and microwave electronics, including for and in support of C-UAS, unmanned aerial drone, missile, radar and air defense related systems. At Kratos, affordability is a technology, with Kratos offerings envisioned and designed up front, for rapid, low-cost manufacturing and production, at scale and in large quantities.

Work under these recently received awards will be performed at secure Kratos manufacturing facilities and customer locations. Due to security related, competitive and other considerations, no additional information will be provided.

***Eric DeMarco, President and CEO of Kratos**, said, "Kratos' technology, products, software and systems are supporting the U.S. warfighter and our allies defense and security related needs and requirements, including in current contested and high intensity conflict areas globally. Kratos' ability to rapidly develop, produce and provide relevant, affordable solutions at scale and in quantity, we believe, is a competitive differentiator for our Company, customers, teammates and partners, and an important element of today's global security and defense environment."*

Kratos wins million$$ award for USSF SATCOM C2 system



Kratos Defense & Security Solutions, Inc. (Nasdaq: KTOS) is the single recipient for the Command and Control (C2) System Consolidated (CCS-C) Sustainment and Resiliency (C-SAR) indefinite-delivery/indefinite-quantity (IDIQ) contract from Space Systems Command (SSC) with a maximum value of $579 million, if all options are exercised.

The start date was December 1, 2023, with options going through to May 31, 2032. Future task/delivery orders will be issued to support operations, sustainment, or enhancements of the CCS-C and related systems.

C-SAR ensures secure and integrated communications for the U.S. MILSATCOM requirements. CCS-C provides consolidated MILSATCOM tracking, telemetry and command capability for the Space Force Space Systems Command (SSC), for on-orbit and anomaly resolution operations. The CCS-C program develops the C2 system for most U.S. MILSATCOM systems, including the Defense Satellite Communications System, Milstar, Wideband Global SATCOM and Advanced Extremely High Frequency satellites.

The C-SAR contract provides sustainment, post-production development services and enhancements for the CCS-C system. C-SAR provides satellite and communication system products, hardware and equipment in support of the SSC's mission to develop, acquire, equip, field and sustain lethal and resilient space capabilities.

***Phil Carrai, President of the Kratos Space, Training and Cyber Division**, said, "Through CCS-C, Kratos supports the U.S. military with the satellite-based services to achieve their mission. This is an important recompete win for one of our largest space domain contracts. Kratos is one of the few companies that can provide a mix of cutting-edge technology and expertise to strengthen global capabilities of the U.S. Space Force, other branches of the U.S. military and international allies."*

DISPATCHES

BAE Systems awarded U.S. Navy C5ISR contract

The U.S. Navy has awarded BAE Systems a contract worth approximately $86 million to continue supporting its Mobile Deployable Command, Control, Communications, Computers, Combat Systems, Intelligence, Surveillance, and Reconnaissance (MDC5ISR) programs.

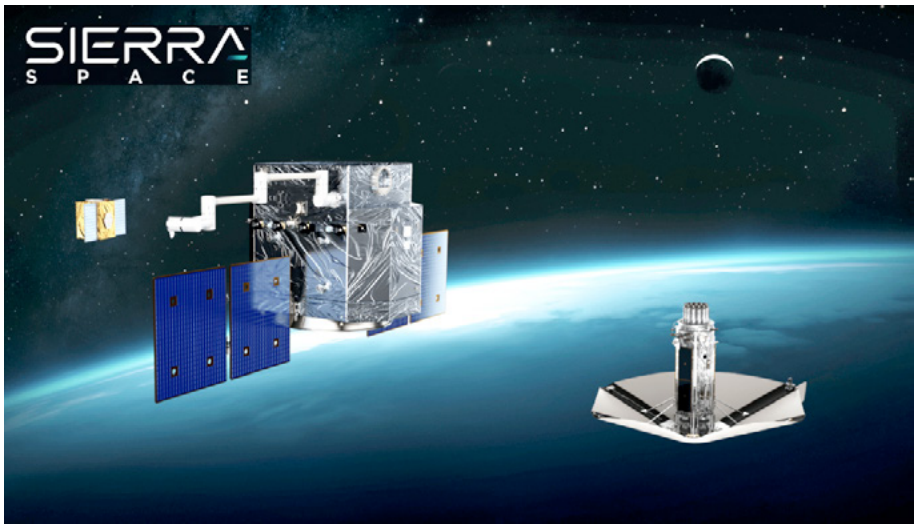
The five-year contract from the ***U.S Naval Air Systems Command***'s ***Naval Air Warfare Center Aircraft Division Webster Outlying Field Special Communications Mission Solutions Division*** will involve the company providing engineering and technical services for new and legacy MDC5ISR systems and platforms.

This follow-on contract includes support for a variety of MDC5ISR products including small craft, transportable systems, en-route communication systems, and intra-platform systems for the U.S. Navy, Special Operations Forces, Homeland Security, and for other Department of Defense (DoD) and non-DoD agencies.

The company will perform work in Lexington Park, Maryland; St. Inigoes, Maryland; and Little Creek, Virginia.

*"As a leading systems integrator, our team brings an unmatched level of expertise to the program," said **Lisa Hand, Vice President and General Manager, BAE Systems Integrated Defense Solutions**. "We have provided quick reaction, integrated C5ISR solutions on this program for more than 35 years and we are proud to continue our support to warfighters deployed around the globe."*

Sierra Space unveils Axelerator™ to address the future of defense technology



Sierra Space** has launched **Sierra Space Axelerator™, an innovation-at-speed incubator designed to fast-track the development of revolutionary defense technologies and mission solutions. Axelerator is set to redefine industry standards by delivering cutting-edge products with unprecedented efficiency.

The first tech to emerge from Axelerator is ***Sierra Space Ghost***, a state-of-the-art, space delivery system engineered to safely return objects from space – and through space – directly to precise locations on Earth. Ghost, a low beta reentry vehicle using revolutionary deployable decelerator technology, represents a significant leap forward in space logistics and recovery operations, promising to enhance the sustainability and safety of space.

Ghost will be able to deliver payloads anywhere in the world in 90 minutes or less, enabling a highly responsive space-based system without the need for a fixed infrastructure. Remarkably, Ghost transitioned from development to flight testing in just 90 days, showcasing Axelerator's rapid prototyping and development capabilities.

Sierra Space is also unveiling ***Spectre***, a revolutionary satellite designed for precision ***rendezvous and proximity operations*** (**RPO**). Sierra Space Spectre embodies the pinnacle of innovation, equipped to perform complex tasks in the challenging environment of space with unmatched accuracy and flexibility. Scheduled for launch in late 2025, Spectre is poised to set new benchmarks for satellite technology.

The third breakthrough announced from Sierra Space's Axelerator incubator is ***Sierra Black OS***, an advanced AI-enabled operating system that will have the ability to operate across space, air and ground systems seamlessly. The inaugural release, ***STAR*** (***Sierra Toolkit for Autonomous Rendezvous***), an RPO software module, exemplifies the system's capabilities, offering unparalleled operational intelligence and autonomy for space missions. Sierra Black OS and STAR are set to revolutionize how space operations are conducted.

The Axelerator incubator is part of Sierra Space's **Orbital Missions and Services** group, founded in 2023 to focus on revolutionary new national security solutions. Since standing up the organization, Sierra Space has been awarded $1.3 billion in prime satellite constellations contracts. In January 2024, the company was awarded a $740 million prime contract by the ***Space Development Agency*** for 18 ***Tranche 2*** satellites to accelerate the capabilities to provide global, persistent indications, detection, warning and tracking of conventional and advanced missile threats, including hypersonic missile systems.

Sierra Space's Orbital Missions and Services has started a new chapter in defense technology, one where innovation, speed, affordability and on-orbit schedule reliability converge to create overmatch capability. At a time when the adversaries of the United States and its allies are significantly increasing their hostile aggressions around the world, Sierra Space is dedicated to innovating at speed to accelerate affordable national security solutions.

*"With Axelerator, Sierra Space is not just imagining the future. We are actively building it," said **Sierra Space CEO Tom Vice**. "Our new products – Ghost, Spectre and Sierra Black OS – are a testament to our commitment to pushing the boundaries of what's possible and driving innovation at the speed of thought. We are proud to contribute to the defense sector with technologies that will shape the future for decades to come."*

DISPATCHES

NOAA satellites helped to save 350 lives during 2023

NOAA's satellites, known for their pivotal role in tracking weather and climate, were behind the rescue of 350 people from harrowing, life-threatening ordeals in the U.S. and its surrounding waters in 2023.

NOAA's polar-orbiting and geostationary satellites are part of the global ***Search and Rescue Satellite Aided Tracking system***, or ***COSPAS-SARSAT***, which uses a network of U.S. and international spacecraft to detect and ***locate distress signals sent from 406MHz emergency beacons*** onboard aircraft, boats and handheld Personal Locator Beacons (PLBs) anywhere in the world. Since its start in 1982, ***COSPAS-SARSAT has been credited with supporting more than 48,000 rescues worldwide***, including more than 10,455 throughout the U.S. and the waters that surround it.

Of the 350 U.S. rescues last year, 255 people were pulled from the water, 44 were saved from aviation incidents and 51 were rescued on land, where PLBs were used. The record one-year total for SARSAT rescues in the U.S. stands at 421 in 2019.

Florida had the most people rescued with 83, followed by Hawaii with 52 and Alaska with 49.

When a NOAA satellite pinpoints the location of a distress signal in the U.S., the information is relayed to the SARSAT Mission Control Center at NOAA's Satellite Operations Facility in Suitland, Maryland. From there, the information is quickly sent to Rescue Coordination Centers, operated either by the U.S. Air Force for land rescues, or the U.S. Coast Guard (USGC) for maritime rescues. NOAA also supports rescues globally by relaying distress signal information to international COSPAS-SARSAT partners.

Image courtesy of Cospas-Sarsat — U.S. beacon registration and registration updating is quick and easy using the National Beacon Registration Database.

"With each life saved, the SARSAT program proves its worth," said ***Steve Volz, Ph.D., assistant administrator for NOAA's Satellite and Information Service****. "NOAA's partnerships with the U.S. Coast Guard, U.S. Air Force, NASA and others around the world are the foundation of SARSAT's long success."*

DISPATCHES

Advanced future military laser achieves UK first

DragonFire is led by the Defence Science and Technology Laboratory (Dstl), on behalf of the ***UK MOD***, working with its industry partners ***MBDA***, ***Leonardo*** and ***QinetiQ***.

This milestone demonstrated the ability to engage aerial targets at relevant ranges and is a major step in bringing this technology into service. Both the Army and Royal Navy are considering using this technology as part of their future Air Defence capabilities.

During a trial at the United Kingdom MOD's Hebrides Range, the DragonFire laser directed energy weapon (LDEW) system achieved the UK's first high-power firing of a laser weapon against aerial targets. The range of DragonFire is classified, but it is a line-of-sight weapon and can engage with any visible target.

- **First high-power firing of a laser weapon against aerial targets**
- **Laser boasts pinpoint accuracy and low, long-term costs**
- **Partnership with industry making positive progress for UK Armed Forces**

DragonFire exploits UK technology to be able to deliver a high power laser over long ranges. The precision required is equivalent to hitting a £1 coin from a kilometer away. Laser-directed energy weapons can engage targets at the speed of light, and use an intense beam of light to cut through the target, leading to structural failure or more impactful results if the warhead is targeted.

Firing it for 10 seconds is the cost equivalent of using a regular heater for just an hour. Therefore, it has the potential to be a long-term low-cost alternative to certain tasks missiles currently carry out. The cost of operating the laser is typically less than £10 per shot.

The latest milestone builds on a series of highly successful trials, including the first static high-power laser firing of a sovereign UK capability and demonstration of the DragonFire system's ability to track moving air and sea targets with very high accuracy at range. Building on this research, the MOD recently announced its intention to fund a multi-million-pound program to transition the technology from the research environment to the battlefield.

The latest trial was sponsored by the MOD's ***Defence Science and Technology*** (**DST**) organization and ***Strategic Programs*** and enabled by many other agencies across government, ensuring all regulatory and safety approval requirements were satisfied.

The DragonFire weapon system is the result of a £100 million joint investment by the Ministry of Defence and industry. Together, the companies involved are supporting highly-skilled UK jobs in new cutting-edge technologies that are delivering a significant step-change in the UK's capability in LDEW systems. In 2017, the MOD's Chief Scientific Advisor's Research Program awarded a £30 million contract to the DragonFire consortium to demonstrate the potential of LDEWs.

UK defence is continuing to invest in these game-changing technologies and is advancing the plans which will ultimately bring them into service.

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Providing deep insight into dynamic solutions in space defense the **MilSat Symposium** constitutes the latter half of **Silicon Valley Space Week (SVSW)**. Join the MilSat Symposium October 23-24 2024.

SVSW.EVENTS

DISPATCHES

Raytheon building defensive microwave antenna system for U.S. military

Raytheon, an RTX business, will design, build and test two high-power microwave antenna systems that will use directed energy to defeat airborne threats at the speed of light.

Under the three-year, $31.3 million contract from the ***Naval Surface Warfare Center Dahlgren Division***, Raytheon will deliver prototype systems to the U.S. Navy and U.S. Air Force as part of the ***Directed Energy Front-line Electromagnetic Neutralization and Defeat*** (DEFEND) program.

"Non-kinetic defense systems are a key part of America's national defense strategy," said ***Colin Whelan, president of Advanced Technology at Raytheon****. "The new iterations of Raytheon's high-power microwave systems are cost-effective and reliable solutions that operate at the speed of light – enabling our warfighters to defend against faster and more maneuverable threats."*

NAVSEA NAVAL SEA SYSTEMS COMMAND
THE FORCE BEHIND THE FLEET

Raytheon has been a leader in the use of high-power microwaves for nearly 80 years.

The new HPM prototype systems build on Raytheon's decades of experience developing capabilities such as the ***Counter-Electronic High Power Microwave Extended Range Air Base Defense***, known as ***CHIMERA***.

Work on this contract is being conducted in Tucson, Arizona in partnership with the ***U.S. Air Force Research Lab***, ***Naval Surface Warfare Center Dahlgren Division*** and the ***Undersecretary of Defense for Research and Engineering***.

Prototypes are expected to be delivered in fiscal years 2024 and 2026.

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