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ESTELLA-CoreE

Ultimate VSAT Performance

One Platform • Multiple Waveforms • Dynamic Capacity on Demand Optimized for Enterprise, Mobility, Cellular Backhaul, Government and Defense Networks

Monetizing Satellite Resources Through AI-Powered Optimization

Dynamic allocation of bandwidth, power and waveforms for maximum spectral efficiency and service agility

More Throughput. More Customers. Higher oversubscription. Better SLAs

ESTELLA-CoreE combines standards-based DVB-RCS2 MF-TDMA (ETSI EN 301 545-2 V1.4.1) with proprietary WaveSwitch™ dynamic waveform assignment, maximizing spectral efficiency, network capacity, service agility, and the monetization of satellite bandwidth and transponder power resources

Innovations

AI-driven, WaveSwitch™ intelligently combines 3D-TDMA, dynamic SCPC and DRA technologies to optimize capacity utilization, reduce operating costs, and support diverse services on a single platform

MODULATION SS-BPSK to 64QAM
CODING 1/3, ½, 2/3,3/4,5/6,6/7,7/8
BLOCK SIZE 266, 532, 1616, 3232

ESTELLA-CoreE 3D-TDMA preserves the structured, interference-free operation of traditional TDMA while significantly improving spectral efficiency through deterministic fast-frequency hopping and dynamic timeslot allocation. Every 26.5 msec, the system independently optimizes three transmission dimensions for each remote and burst: MODCOD, burst size (symbol rate/roll-off), and individual BUC transmit power, maximizing throughput, network capacity, and satellite resource utilization under changing traffic loads and link conditions. ESTELLA-CoreE dynamically selects from 72 waveform profiles, spanning spread-spectrum operation at -15 dB Es/No to 64QAM at +18.3 dB Es/No, enabling rapid adaptation to traffic demands and link conditions while leveraging DRA, ULPC and ACM to maximize performance and resilience.

Dynamic Rate Assignment (DRA/BM-FDMA) is a core ESTELLA-CoreE scheduling technology that dynamically generates return-link carriers on a frame-by-frame basis to match traffic demand and 3D-TDMA resource allocations. By continuously optimizing carrier frequency, bandwidth, and waveform assignments every 26.5 msec, DRA maximizes spectral efficiency, satellite bandwidth/power ratio utilization, network capacity, and service agility.

WaveSwitch™ extends ESTELLA-CoreE's 3D-TDMA and DRA technologies by dynamically and error-free switching remotes between shared TDMA and dedicated continuous carriers. Operating on a burst-by-burst basis with full traffic bit count integrity, WaveSwitch™ enables higher-order MODCOD by focusing BUC power in dedicated smaller carriers: increases throughput, achieving SCPC-class spectral efficiency, low latency, minimal jitter, radically optimizes and significantly reduces satellite bandwidth/power ratio and consumption, assures SLA delivery.

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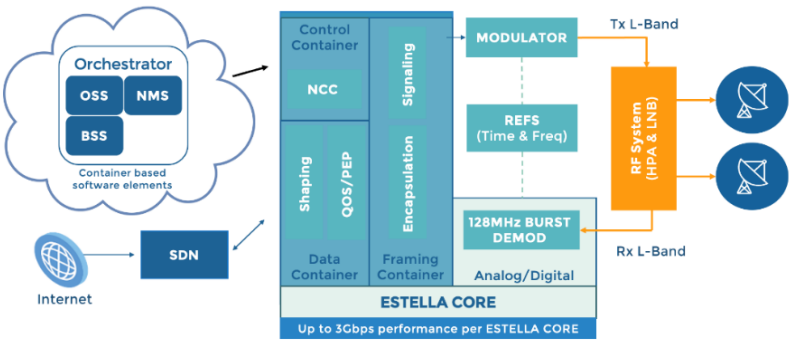
ESTELLA-CoreE

ESTELLA-CoreE is a high-performance Compute platform and Multi-Channel Demodulator (MCD) platform that forms the core of the VSAT Hub infrastructure. By decoupling baseband processing from modulation and RF subsystems, ESTELLA-CoreE seamlessly integrates with SB external modulators to provide a flexible, scalable, and hardware-agnostic architecture. Its distributed software-defined design supports multi-waveform operation, dynamic resource allocation and elastic scaling from small networks to large, carrier-grade deployments, enabling operators to maximize spectral efficiency, simplify network expansion, and optimize the utilization of satellite bandwidth and power resources



Features and Benefits

Dual L-band Interfaces

Two independent 900–2450 MHz L-band inputs enable wideband LEO/ HTS reception, contiguous and non-contiguous carrier aggregation, simultaneous dual-polarization operation, and dual-satellite connectivity.

Multi-Channel Demodulator (MCD-4LE)

The Gen IV Multi-Channel Demodulator (MCD-4LE) is ESTELLA-CoreE's high-performance return-link processing engine, supporting DVB-RCS2 and WaveSwitch™/ Dynamic Rate Assignment (DRA) technologies, including 3D-TDMA anddSCPC. Capable of dynamically processing up to 200 carriers per 38 MHz channel across 2,500 MHz of frequency spectrum, the MCD-4LE delivers exceptional scalability, flexibility, and spectral efficiency in **5 × 38 MHz Channels**, provides:

- Automatic carrier definition from **160 kHz to 38 MHz**
- Aggregate frequency bandwidth up to **190 MHz**
- Aggregate symbol rate up to **180.95 Msps (5% roll-off**) or **172.72 Msps** (**10% roll-off**)
- Return-link aggregated payload data capacity (excluding overhead) up to **780 Mbps**

FEC and Spectral Efficiency

Employs 16-state 2D-Turbo Φ FEC to deliver high spectral efficiency, low latency, and robust link performance. Advanced FPGA-based signal processing supports MODCODs up to 64QAM 6/7, with roll-off factors and carrier spacing down to 5%, maximizing transponders utilization and increasing return-link capacity.

Compute Platform Functions

The ESTELLA-CoreE Compute Platform provides the AI intelligence, control, and traffic-processing functions of the VSAT Hub, supporting aggregate network throughput of up to 3.6 Gbps, while enabling dynamic capacity orchestration, traffic optimization, and carrier-grade service delivery.

Traffic Shaping and QoS

Provides granular traffic management, service differentiation, bandwidth guarantees, priority queuing, congestion control, and application-aware policies to ensure predictable service delivery and SLA compliance.

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ESTELLA-CoreE™ CORE

Ultimate VSAT Performance

One Platform · Multiple Waveforms · Dynamic Capacity on Demand Optimized for Enterprise, Mobility, Cellular Backhaul, Government and Defense Networks

Features and Benefits

Network Control Center (NCC)
Dynamically allocates satellite bandwidth and satellite power resources to individual remotes UT based on traffic demand, QoS policies, Service Level Agreements (SLAs), terminal capabilities, antenna size, BUC power, modem type, and real-time link conditions (Es/No). AI and advanced scheduling algorithms continuously optimize network spectral efficiency, throughput, and fairness across the entire VSAT network.

Encapsulation and Signaling
Encapsulates user traffic and NCC signaling into DVB-GSE or GSE-Lite streams and Baseband Frames (BBFrames) for transmission over the forward link. On the return link, decapsulates remote traffic, reconstructs IP packets, and forwards traffic to the terrestrial network infrastructure.

Security and Authentication
Supports carrier-grade security mechanisms including AAA (Authentication, Authorization, and Accounting), role-based access control, secure management interfaces, and X.509 certificate-based authentication for terminals, operators, and network elements. Mutual authentication mechanisms ensure only authorized devices gain access to network resources.

Network Optimization
Integrated Layer-2 and Layer-3 optimization functions improve satellite efficiency through traffic acceleration, protocol optimization, compression techniques, and intelligent resource allocation. Optional cellular backhaul optimization supports 2.5G/3G/4G/LTE/5G traffic acceleration and GTP optimization.

High Availability and Redundancy
Supports 1+1/N+1 redundant Hub configurations, automatic failover, database synchronization, and geographically diverse deployments on-line or off-line to ensure continuous service availability and DR network resilience.

Open Architecture and Integration
Standards-based architecture with Northbound RESTful APIs enables integration with OSS/BSS and Billing platforms, SDN orchestrators, network management systems, and third-party operational tools.

Network Monitoring and Analytics
Provides real-time monitoring of network performance, terminal status, traffic utilization, QoS metrics, and satellite resource consumption. Historical reporting and analytics simplify troubleshooting, capacity planning, and operational optimization.

Dynamic Capacity Orchestration
Real-time allocation of bandwidth, power, timeslots, carriers, and waveforms based on traffic demand, QoS requirements, and network loading conditions.

Intelligent Resource Management and Network Automation
ESTELLA-CoreE leverages advanced automation and intelligent scheduling (AI) to minimize satellite bandwidth and maximize power and Hub resource utilization. Continuously adapting to network conditions, traffic demand, terminal capabilities, and service policies, ESTELLA-CoreE dynamically optimizes capacity allocation to maximize performance and profitability.

Multi-Waveform Optimization. Supports DVB-RCS2 and WaveSwitch™, dynamically selecting 3D-TDMA or BM-FDMA (dynamic SCPC) per remote. Delivers bandwidth-on-demand (BoD) allocation, high spectral efficiency, scalable oversubscription, fixed latency, low jitter, and site-optimized RF resource utilization in a single integrated appliance.

Spectral Efficiency Optimization. Continuously optimizes assignments of carriers, MODCOD selection, burst profiles, and waveform parameters to maximize throughput while minimizing bandwidth/power consumption.

Adaptive Network Operation
Automatically responds to changing traffic patterns, weather conditions, satellite impairments, and terminal link quality to maintain service availability and SLA compliance.

Signal Obfuscation. DSSS and FHSS waveforms provide low probability of detection and interception (LPD/LPI). User Terminals (UTs) acquire network synchronization without a GPS reference using a novel patent-pending timing acquisition technique, enabling rapid network entry and simplified deployment.

Service Differentiation. Enables multiple service classes with configurable bandwidth guarantees, committed information rates (CIR), maximum information rates (MIR), priority handling, and application-specific policies.

Operational Efficiency
Reduces manual intervention through automated resource allocation, policy enforcement, performance monitoring, and network optimization, lowering operational costs while improving service quality and SLAs.

Future-Proof Platform
Software-upgradable architecture designed to support evolving satellite technologies, new waveforms, advanced optimization algorithms, and GEO, MEO, and LEO network architectures.

LEO and HTS/UHTS Focus
Purpose-built for LEO and HTS/UHTS networks, maximizing spectral efficiency through dynamic waveform selection, adaptive scheduling, and real-time resource optimization.

Monetization
AI transforms satellite bandwidth and power into revenue-generating capacity through intelligent scheduling, dynamic resource allocation, and service-aware optimization.

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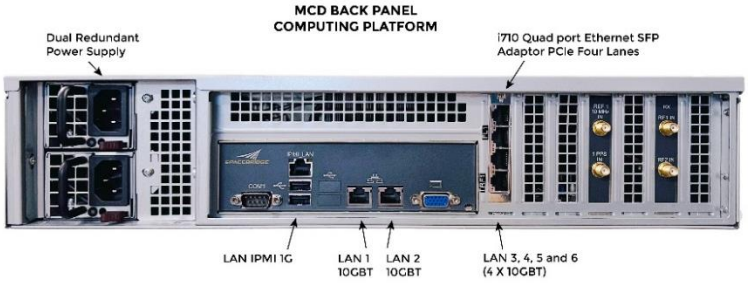
ESTELLA-CoreE Front and Back Views



BURST DEMODULATOR CHARACTERISTICS	
RX Burst Demod Capacity	190MHz
Return Link FEC	16-state 2D-Turbo Φ for DVB-RCS2/WaveSwitch™
License Based	YES
Number of Channels	Up to 5 (38 MHz) channels
Bandwidth/Channel	From 160 kHz to 38 MHz
Aggregated frequency	up to 190MHz, contiguous or anywhere across the 2.5 GHz band, or polarizations
Maximum aggregate symbol rate	180.95 Msps (5% roll-off) 172.72 Msps (10% roll-off)
Number of Carriers/Ch	up to 200
Max number of carriers:	1,000
Min carrier size	160kHz, DVB-RCS2/dSCPC
Largest Carrier size	38MHz
Roll-off/Spacing factor	5%, 10%, 15% and 20%
MODCOD, all Coding Rates Optional, all Coding Rates	QPSK, 8PSK, 16QAM, a) DSSS-BPSK/QPSK, BPSK, b) 32QAM, and 64QAM
Block sizes	266, 532, 1616, 3232
WaveSwitch™ option	Adaptive multi-waveform technology combines the efficiency of TDMA with the performance of SCPC
Dynamic Rate Assignment (DRA)	Combined with Wave-Switch for maximum spec-tral efficiency and seamless traffic optimization
# of Waveforms	72
Variable MODCOD/Site	YES, all MODCOD available
Frequency range	950-2450MHz
Return Link Fade Mitigation	Dynamic Rate Assignment (DRA) coupled with dyna-mic Waveform provided per site ACM and ULPC

INTERFACES	
User Data Interface	4 x SFP or RJ45 1/10GbE
MGMT Interface	2 x RJ45 1/10GbE
Monitor and Control	Web Server (HTTPS) Syslog (encrypted)
Connector Type	4 x SMA: 2x RX Input 1 & 2 10MHz and 1pps Inputs
Return Loss	> 12 dB
Carrier Signal to Noise ratio (Es/No)	-15.6 to +18.5 dB (lowest is DSSS Repetition 16, BPSK, CR 1/3; Highest 64 QAM CR 6/7)
10 MHz Ref Clock	-5 to +5 dBm (50 Ohm) sinus reference input
1 PPS Input	1pps input TTL or 50 Ohm
Network Synchronization clock	NTP based NCR/PCR

MECHANICAL ENCLOSURE SPECS	
Form factor	2RU Server format
Dimensions (WxHxD)	19 “ x 3.5” x 26”
Weight	12 kg
Power Consumption 90-130 & 180-260VAC, 47-63 Hz	MCD-4LE: 360W
Power Supply Redundancy	Dual Redundant 800W Hot swappable plug-ins
Operating Conditions	0°C to +50°C
Storage Conditions	-30°C to +85°C
Relative Humidity	10% to 90% humidity, non-condensing
Operating Altitude Above Mean Sea Level (AMSL):	Up to 10,000 feet (3000 meters) with temperature derating with altitude of 5°C/1,000 m AMSL

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