SPACEBRIDGE
ALL THINGS CONNECTED

ESTELLA/UniHUB CORE

One platform, multiple waveforms, dynamic carriers on demand to meet all market verticals

ESTELLA redefines scalable and high efficiency TDMA solution via dynamic network automation and performance optimization. ESTELLA provides total capacity management, harnesses most efficient forward and return link waveforms to deliver flexible and dynamic capacity to support more customers, provide differentiated services, and better SLAs.

ESTELLA Harnesses 3 INNOVATIONs

ESTELLA combines our 3D Time Division Multiple Access (TDMA) Waveform, our quasi-SCPC WaveSwitch™ waveform, and our Dynamic Rate Assignment (or Burst Mode-Frequency Division Multiple Access; BM-FDMA) features together to offer a SATCOM solution which can meet any operator requirement everywhere.

Innovations

ESTELLA 3D TDMA preserves the structured and interference free communication benefits of traditional TDMA but enhances the efficiency of the satellite channels/carriers by allowing for variable timeslot sizing to accommodate our 3D (3 Decision Factor) Modulation/Coding/Block sizes (MCB) selections/per burst/per site. The ESTELLA can instruct each remote to select from among 60 MCB options (ranging from spread spectrum Es/No at -15dB to 64QAM Es/No at +18dB) to best meet its connectivity needs allowing for ESTELLA to rapidly adapt the remote MCB selections providing best performance while inherently utilizing adaptive coding modulation (ACM) to protect against link degradations or interference

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

Dynamic Rate Adaptation (DRA or BM-FDMA) is a component of the ESTELLA scheduler which redefines return link satellite channels/ carriers per burst to accommodate the ever-changing traffic patterns and 3D TDMA timeslot profiles. This DRA is akin to BM-FDMA in that the carrier definitions are created dynamically every burst interval and so carrier frequency allocations are always changing to provide the highest yield of performance across the entire network

WaveSwitch™ builds upon our 3D TDMA and DRA capabilities, allowing for remotes to be switched between shared TDMA carriers to dedicated SCPC carriers based on factors to determine the overall best interest of the network. Switching is dynamic, completely hitless (errorless) and preserving full bit count integrity, on per burst interval. Switching to Waveswicth allows remotes to focus BUC power to improve MCB selection leading to higher throughput with less Hz.

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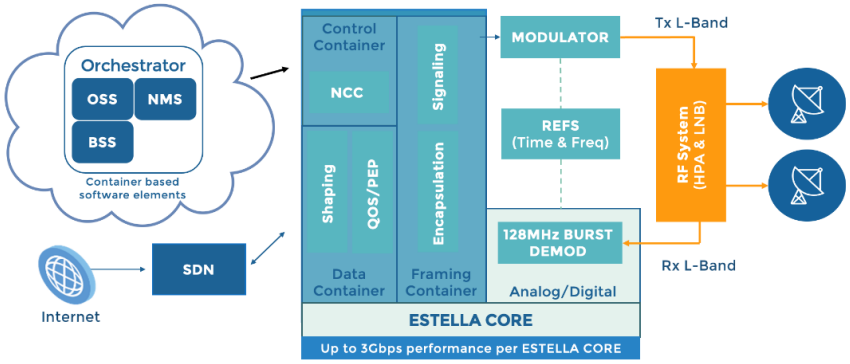
ESTELLA CORE

- ESTELLA is a Compute and Multi-Channel Demodulator (MCD) platform which couples with external Modulators and RF Systems to provide a flexible and highly scalable VSAT HUB solution.
- UniHUB is a reduced capacity ESTELLA with up to 2x integrated modulators in a 3U chassis (intended for tactical deployments or starter HUBs)



Features and Benefits

Dual L-band Interfaces

- Two separate L-band 950-2400MHz interfaces are provided to support wideband HTS, connections to dis-contiguous channel on a polarity, or even connect to both satellite polarities at the same time.

Multi-Channel Demodulator (MCD)

- MCD provides support for 3D TDMA, DRA and WaveSwitch across 128MHz capacity. Carriers are auto defined as small as 160kHz to as large as 32MHz.
- Upto 800 carriers over the entire band.
- Massive return capacity : upto 640Mbps

Spectral efficiency

- MCD supports 16-state Turbo codes providing high spectral efficiency with low delay.
- RLS modern algorithms and filtering allows for carrier spacing as tight as 5%. Providing more useable bandwidth within the VSAT return technology range.

Modulator (UNIhub)

- UNIhub may include up to 2x DVB-S2X modulators.
- Each modulator supports up to 80MHz in a single or multi-carrier environment.

Compute Platform Functions

The Compute platform provides the ability for ESTELLA to support up to 3Gbps of traffic. It consists of:

- **Network Communication Controller (NCC):** dynamically allocate satellite capacity to/from individual remotes based upon predefined metrics such as remote demands, QOS, Service Level Attributes (SLA) coupled with knowledge of remote site information (remote dish size, BUC power, modem type, and return link EsNo).

- **Shaping/QOS:**
- Allow operators to effect essential management of traffic and differentiated services across the ESTELLA platform.

- **Encapsulation/Signaling:** provides the function of encapsulating user traffic and NCC signaling within GSE streams and building baseband frames (BBFrames).
- On the return, it decapsulates RLE traffic from the remotes, rebuilds IP packets and forwards the traffic to the core routers.

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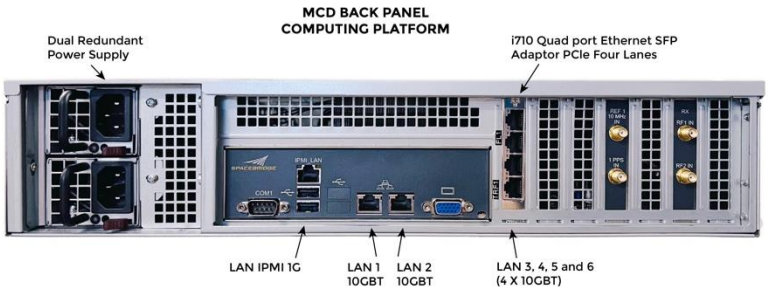
ESTELLA CORE
Technical Specifications



BURST DEMODULATOR CHARACTERISTICS	
RX Burst Demod Capacity	128MHz
Return Link FEC	RCS2 (TPhi)/WaveSwitch™
License Based	YES
Min carrier	160kHz
Largest Carrier	32MHz
Min WaveSwitch™ carrier	160kHz
RO/Spacing factor	down to 5%
Number of carriers	800
MODCOD	DSSS-BPSK/QPSK, BPSK, QPSK, 8PSK, 16QAM, 32QAM, 64QAM
Block sizes	266, 536, 1616
# of Waveforms	60
Variable MODCOD/Site	YES
Dynamic Rate Assignment (DRA)	YES
Frequency range	950-2400MHz
Return Link Fade Mitigation	Dynamic Rate Assignment (DRA) coupled with dynamic Waveform provide per site ACM capability.

INTERFACE	
User Data Interface	2x RJ45 (10Gbase-T)
MGMT Interface	4x RJ45 (100/1000baseT)
Monitor and Control	Web Server (HTTPS) Syslog (encrypted)
Connector Type	5xSMA : 2x RX, 2x TX, 1x10MHz for LNB
Return Loss	>+ 12 dB
Carrier Signal to Noise ratio	-15.6 to +18.5 dB (lowest is DSS Repetition 16, BPSK, CR 1/3; Highest 64 QAM CR 6/7)
10 MHz Ref Clock	BNC: -5 to +15 dBm (50 Ohm) sinus reference input
1 PPS Input	BNC: 1PPS input TTL/50 Ohm

MECHANICAL ENCLOSURE SPECS	
Form factor	Server format
Dimensions (WxHxD)	WxHxD: 19 “ x 2 RU x 26”
Weight	8 kg
Power	90-130 & 180-260Vac, 125 VA, 47-63 Hz, 200W
Operating Conditions	0°C to 50°C
Storage Conditions	-20°C to 85°C
Humidity	10% to 90% humidity, non-condensing

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UniHUB CORE
Technical Specifications

BURST DEMODULATOR CHARACTERISTICS	
RX Burst Demod Capacity	36MHz
Return Link FEC	RCS2 (TPhi)/WaveSwitch™
License Based	YES
Min carrier	160kHz
Largest Carrier	20MHz
Min WaveSwitch™ carrier	160kHz
RO/Spacing factor	down to 5%
Number of carriers	200
MODCOD	BPSK, QPSK, 8PSK, 16QAM, 32QAM, 64QAM
Block sizes	266, 536, 1616
# of Waveforms	60
Variable MODCOD/Site	YES
Dynamic Rate Assignment (DRA)	YES
Frequency range	950-2400MHz
Return Link Fade Mitigation	Dynamic Rate Assignment (DRA) coupled with dynamic Waveform provide per site ACM capability.

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10 MHz Ref Clock	BNC: -5 to +15 dBm (50 Ohm) sinus reference input
1 PPS Input	BNC: 1PPS input TTL/50 Ohm

MODULATOR CHARACTERISTICS	
Number of modulators	2x 80MHz modulators (each modulator can support multi-carrier partitions)
Waveform/FEC	DVB-S2/S2x (BPSK, QPSK, 8PSK, 16APSK to 256APSK, Short and Normal Frame)
RO/Spacing factor	down to 5%
License Based	YES
Output	+7 dBm to -35 dBm / SMA 50 Ω
Frequency range	950-2150MHz
PCR insertion	Yes

Compute INTERFACE	
User Data Interface	2x RJ45 (10Gbase-T)
MGMT Interface	4x RJ45 (100/1000baseT)
Monitor and Control	Web Server (HTTPS) Syslog (encrypted)

MECHANICAL ENCLOSURE SPECS	
Form factor	Server format
Dimensions (WxHxD)	WxHxD: 19 “ x 3 RU x 26”
Weight	18.5 kg
Power	90-130 & 180-260Vac, 125 VA, 47-63 Hz, 200W
Operating Conditions	0°C to 50°C
Storage Conditions	-20°C to 85°C
Humidity	10% to 90% humidity, non-condensing