



SpaceBridge ESTELLA™ Multi-Service HUB Solution

The SpaceBridge ESTELLA™ provides a open standards based DVB-RCS2 platform serving as an central point for exchange of information and services to individuals, commercial entities, government, B2B and others.

SpaceBridge ESTELLA™ hub solutions are designed to support the well-established, open standards of DVB-RCS2 for TDM/TDMA networks. Those standards, published by ETSI, are the only open, fully documented standards for TDM/TDMA technology.

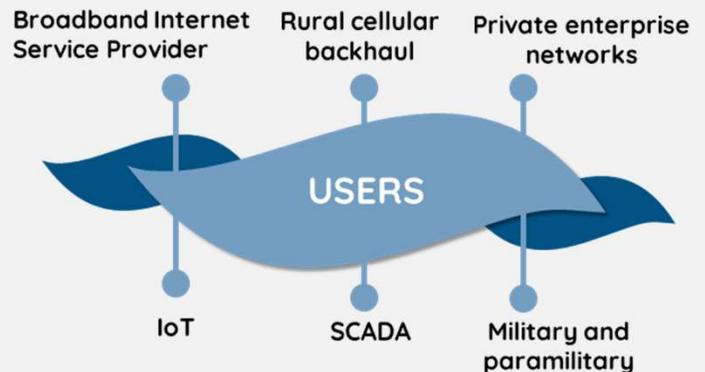
Services rendered:

Broadband ISP: Provides essential broadband Internet services over satellite. ESTELLA™ scales to thousands of remotes, supporting oversubscribed services while providing essential user experience enhancements such as IP TCP acceleration over satellite.

Rural Cellular Backhaul: In the new age of data centric and high priority cellular backhaul services, ESTELLA™ provides mobile operators the opportunity to deploy right sized networks tailored to their networking needs. High level of bandwidth sharing, QOS enforcement, and bandwidth efficient FWD/Return link, and cellular traffic optimization are key features in this important market.

Private Enterprise networks: TDM/TDMA networks have long been favored by enterprise or commercial networks with large or medium number of remotes (gas stations, bank branches, insurance offices, POS, school internet services, highway speeding monitoring systems). ESTELLA™ provides efficient network utilization while offering ability to support encrypted and highly secure traffic across the networks.

ESTELLA™



IoT and SCADA: Intermittent or low usage traffic demands are often required in obscure and distant locations. ESTELLA low cost, low residual bandwidth and low power requirements provide a very effective solution to address this market.

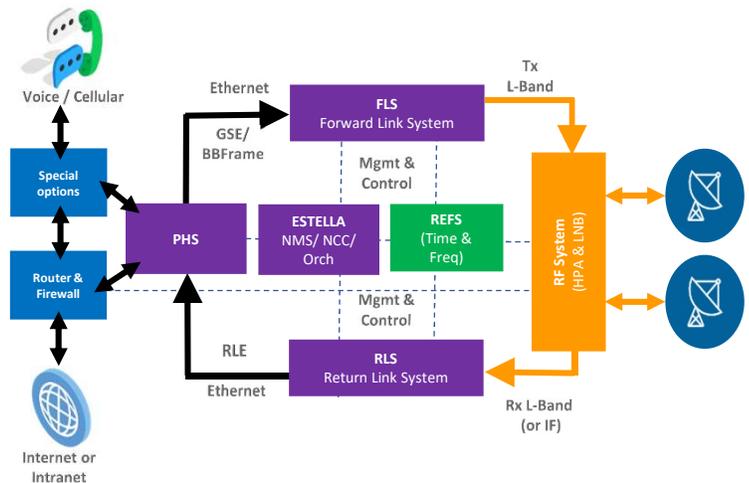
Military and paramilitary : Whether it is emergency response services, or military needs such as naval services or COTP/COTM, ESTELLA™ provides essential on-demand bandwidth and support for mobility, beam hopping and other services to ensure connectivity everywhere and all the time.

Core Building blocks

Forward Link Sub-System (FLSS): SpaceBridge provides highly efficient license based DVB-S2X forward links from 10Msys to 125Msys, 250Mpsps or 500Mpsps. Multiple forward links may be deployed to cover different beams or overlapped within a beam to boost coverages. To best service the needs of each individual UT, the FLS supports 32 MODCODs and Adaptive Coding Modulation (ACM) providing ability to change MODCODs dynamically based on UT link conditions. Additionally, the FLS timestamps all traffic to provide highest accuracy SYNC to the deployed UTs.

Return Link Sub-System (RLSS): SpaceBridge RLS is focused around the Multi-Channel DVB-RCS2 Burst Demodulator (MCD4L). MCD4L provides massive return link capability (up to 650Mbps) over 128Msys based on powerful 16-state TurboPhi FEC code, while supporting return channel spacing as low as 5%. The MCD4L supports 2 L-band interfaces allowing for flexibility of connectivity options. Based on burst time plans shared by NCC, MCD4L dynamically demodulates UT traffic which may use any of 140 Waveform IDs per timeslot, between SS-BPSK and 64QAM, every 26.5msec interval. The MCD4L provides support for the widest range of link conditions to be experienced by UT (from CoTM to high throughput fixed sites).

Network Management System (NMS and Network Communications Controller (NCC): SpaceBridge NMS manages the “static” configuration of all HUB and remote ground equipment’s, VNO groupings and provisioning’s, and QOS profiles. It also collects essential statistics from all networking elements. A multitude of NCCs communicates with NMS, RLSSs, FLSSs to execute real time network allocation of resources across FLSS and RLSS to meet NMS parameters.



Packet Handling System (PHS): The PHS is the heart of the ESTELLA system and provides the user data traffic mediation (encapsulation of traffic into GSE/BBFrames toward the FLS and re-assembly of traffic from RLS), QOS, and IP Performance Enhancement Proxy (PEP). A single PHS can service a multitude of FLS and RLS allocated to a single beam or multiple beams. Additionally, it interfaces with the NMS/NCC and communicates essential burst plan, synchronization and timing and user traffic over GSE/BBFrames to all the UT.

Timing and Sync: SpaceBridge offers critical reference timing, frequency and NTP based on GPS/Glonass source tied into high holdover circuits. The references are used throughout the hub FLS/RLS systems to ensure adherence to stringent DVB-RCS/RCS2 specifications.

Redundancy: High availability is required for any successful commercial TDM/TDMA offering, ESTELLA provides redundancy ratios of 1:1 for most systems to N:1 (max 8) on others. Additionally, ESTELLA™ supports GEO redundancy for either entire HUB or limited to RF components. Coupled with redundancy in the ingress switch/routing environment, the ESTELLA™ offers up to 99.99% availability.

Forward Link Sub-System

FLSS functions	Received baseband frame from PHS, burst plan from NCC, and PCR timing information and modulates the traffic into DVB-S2X for transmission across satellite.										
Waveform Technology	DVB-S2/S2XACM, QPSK to 256APSK, all coding and roll off rates (supports 32 MODCOD for ACM)										
Encapsulation Modes	GSE Encapsulation										
Symbol Rate	From 10 Msys to 125Msys for FLS220; and 10Msys to 500Msps for MOD1250										
Channel Roll-off and Spacing	5%, 10%, 15%, 20%, 25%										
RF Performance	L-Band output : 950 to 2150 MHz (1 Hz steps) Output power range: -40 to +5dBm Phase Noise as a function of offsets (dBc/Hz): <table border="1" style="margin-left: 20px;"> <tr><td>10 Hz</td><td>-82</td></tr> <tr><td>100 Hz</td><td>-97</td></tr> <tr><td>103 Hz</td><td>-102</td></tr> <tr><td>104 Hz</td><td>-105</td></tr> <tr><td>105 Hz</td><td>-115</td></tr> </table> Spurious: -55 dBc max Harmonics: -40 dBc max	10 Hz	-82	100 Hz	-97	103 Hz	-102	104 Hz	-105	105 Hz	-115
10 Hz	-82										
100 Hz	-97										
103 Hz	-102										
104 Hz	-105										
105 Hz	-115										
Terminal IF TX Interface	F-type 75 Ohm supporting multiplex of 10MHz onto IF signal.										

Return Link Sub-System

RLSS function	Burst demodulator supporting up to 800 carriers over 128Msps (capacity may be split along two RF interfaces). Support DVB-RCS2 TDMA and WaveSwitch™ dynamically.
Max Symbol rate per chassis	128Msps
RF Performance	L-Band output : 950 to 2400 MHz (1 Hz steps) Return Loss: >+12dB Power level Range: -77dBm to -21dBm Input Noise Density: -123 dBm/Hz Isolation between RF ports: 35dB min
Carrier Signal to Noise Ratio	-15.6 dB to +18.5 dB (lowest is DSSS Repetition 16, BPSK, CR 1/3; Highest 64 QAM CR 6/7)
Waveform Technology	16 State Turbo Phi supporting 140 Waveform IDs across SS-B/QPSK, BPSK, QPSK, 8PSK, 16QAM, 32APSK, 64QAM
Encapsulation Modes	RLE Encapsulation
Symbol Rate per carrier	From 128Ksps to 32Msps
Channel Roll-off and Spacing	5%, 10%, 15%, 20%, 25%
Link Variation Mitigation	Terminal built-in Uplink Power Control (ULPC) and Return Link ACM/DRA supporting Ka, Ku and C-band
Terminal IF RX Interface	SMA 50 Ohm

Network Management System (NMS) and Network Control Center (NCC)

NMS Function	Provides network wide configuration, monitoring, and archival of hub function and performance. May support anywhere from small number of remotes to hundred of thousands Also supports VNO management
NCC Function	execute real time network capacity allocation across FLSS and RLSS to meet NMS parameters
Architecture	Single or multiple servers

Packet Handling System

PHS Function	Encapsulation/Decapsulation: PDU packing into GSE/BBFrame and PDU re-assembly from RLE frames QOS enforcement (million flows) in 256 queues IP PEP services: TCP spoofing, Header and payload compression
Architecture	Single or multiple servers (functions can be combined into one server for smaller networks or spread across multiple server blades to scale to multi-gigabit speeds)
User Data Interface	2 x RJ45 (10Gbase-T), or 2 x 40GBT (SFP)
MGMT ports	2 x RJ45 (100/1000BaseT Ethernet)
Upload processing (toward FLSS)	Up to 3Gbps
Download Processing (from RLSS)	Up to 650Mbps

Timing and Sync

GNSS-NTP-Sync	Provides the following functions to the HUB: <ul style="list-style-type: none"> Distributes 1PPS signals Distribute 10 MHz signals Provides NTP server function NMEA 0183 serial data Capability to be remotely monitored and controlled via a GUI or REST
Architecture	Supports standalone (non-redundant), 1:1 redundant and M:N redundant deployments
Interfaces	Provides 10 x 10MHz, 8 x 1pps, 1 x NEMA serial port, 1 x 100BaseT Ethernet and NTP
Redundancy	M:N

Redundancy

Redundancy function	Redundancy options are available across all major subsystems in 1:1 and in many cases M:N. Additionally to individual subsystem support, also supports full Geographical HUB, Teleport and Satellite redundancy All GUI and IP manageable
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