## Specifications

### Compression & Encryption
- **Header Compression**: MPE, UDP/IP, and RTP/UDP/IP
- **TRANSEC**: AES-256 encryption on Layer 2 (optional)

### IP Routing
- **Terrestrial-Side Routing**: RIP V2, OSPF, BGP, MPLS Edge (Requires IP Router or L3 switch option)
- **Satellite-Side Routing (in FLS)**: Dynamically linked to NMS set-up of each VSAT, VNO, & VSN
- **Multicast IP**: Multicast IP forwarding & IGMP at VSAT
- **VSN/VLANs**: Virtual Satellite Networks (RCS2), each with independent IP address spaces, using 802.1Q VLANs in Hub, also supporting MPLS Network Integration

### Shaping/QoS & Acceleration
- **Traffic Shaping**: Shaping with rate limiting per VSAT and per VSAT Group; Granularity of 1 kbps
- **QoS**: 4 different QoS Classes, 7 queues; multi-field IP packet classification rules in headers at Layers 2, 3, & 4 on Forward and Return (plus Mesh Links with DVB-RCS)
- **TCP Acceleration**: Up to 10 Mbps per connection; up to 25,000 accelerated bi-directional TCP sessions per Network Accelerator module
- **Cisco Integration Option**: QoS, TCP Acceleration & IP QoS Metrics enabled through integration with Cisco

### Time & Frequency References
- **Time Protocols**: TP (RFC 868)/ NTP (RFC 1305)
- **Frequency Stability**: 10^-9 or better if slaved to GPS
- **NCR Stability**: Better than 37ns with respect to UTC

### Compliance
- **CE**: Compliant with RE directive
- **DVB-RCS2**: ETSI EN 301 545-2
- **DVB-RCS**: ETSI EN 301 790
- **DVB-S2**: ETSI EN 302 307

### TDM Forward Links
- **Symbol Rates (S2)**: 1-45 Msp/s, increments of 100 sps
- **Outer/Inner FEC (S2)**: BCH/LDPC
- **MODCODs (S2)**:
  - QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
  - BPSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
  - 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
  - 32APSK: 3/4, 4/5, 5/6, 8/9, 9/10
  - ACM (S2): Full-range or custom list, plus min & max MODCOD configurable by VSAT
- **FEC Frames (S2)**: Normal (64 Kbit) and Short (16 Kbit)
- **Roll-off Factor (S2)**: 20%, 25%, or 35%
- **Automatic UPC (S2)**: Built-in to FLS (requires beacon receiver)
- **IP Encapsulation (S2)**: GSE and MPE/MPEG-TS Option for legacy DVB-S

### Return Links; TDMA and SCPC
- **Symbol Rates (RCS2)**: 125 Ksp/s to 8 Msp/s FEC
- **Type (RCS2)**: 16-State Turbo Code MODCODs
- **MODCODs (RCS2)**:
  - BPSK: 1/3, 1/2
  - QPSK: 1/3, 1/2, 2/3, 3/4, 5/6
  - 8PSK: 2/3, 3/4, 5/6
  - 16QAM: 3/4, 5/6
- **ACM (RCS2)**: Full-range with min & max MODCOD configurable by VSAT
- **Carrier Spacing (RCS2)**: Down to 1.12x symbol rate
- **TDMA Carriers per RLS (RCS2)**: 1-24 within 40 MHz
- **IP Encapsulation (RCS2)**: RLE per standard SCPC (RCS2): Dedicated carrier for Tx Option for legacy DVB-RCS: Selectable per RLS unit

### SatLink® NMS & NCC: Highlights
- **Database**: Oracle™ with back-up, restore, & roll-back
- **VNOs (Virtual Network Operators)**: Access controls for each staff member of a VNO, no extra HW required
- **VSAT Groups**: 24 VSAT Groups per TDMA Carrier Group
- **Capacity Requests**: Rate, Volume, & Combined Mode VSAT Provisioning: Web-based, fast and simple
- **MF-TDMA Resource Control**: Assignment policies per QoS class by VSAT and VSAT Group; ACS assigns feasible symbol rate
- **MF-TDMA Frame Structure**: May be tailored per carrier
- **Topologies**: Star (and Mesh/Hybrid with DVB-RCS)
- **OSS/BSS Integration with SatLink® NMS**: North-bound software integration interface provided via REST API

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SatLink® Hub Family

Product Overview

The SatLink® Hub Family is a member of a family of SatLink® products and systems from NSSLGlobal Technologies enabling scalable, high-availability DVB-RCS & DVB-RCS2 networks including: VSATs, Hubs, and Hub components, with value-added options for advanced data, voice, and video networking via satellite.

SatLink® Hubs provide the high-performance modems, IP gateway, and management and control functions for all SatLink® VSAT networks. The Hub design employs SatLink®’s Open Hub Architecture using a common set of modules for scalability, efficiency, throughput and re-configuration. They implement a TDM/TDMA network in compliance with DVB-S2 & DVB-RCS2 standards, offering Bandwidth-on-Demand, ACM, and Quality of Service(QoS) on all carriers. SatLink® also has an optional SCPC mode for added flexibility. All SatLink® networks are fully managed by the SatLink® NMS.

A full range of SatLink® Hub configurations are available from small portable Hubs to carrier-class high-availability Hubs with 99.999% uptime. Hubs configured with redundancy in key modules can be upgraded with minimal or no disruption to traffic flows.

NSSLGlobal Technologies pioneered the DVB-RCS & DVB-RCS2 protocols working in partnership with the European Space Agency, utilising them on satellite networks to deliver superior performance for telecom service providers, ISPs, NATO and governments, enterprises and partners across the globe additionally offering turnkey integration, installation, and 24/7/365 global technical support. All backed up by the NSSLGlobal Group.

Features & Benefits

- **Bandwidth Efficiency at Many Levels**
  The efficiency of DVB-S2 forward links is matched with DVB-RCS2 return links offering ACM per burst, Adaptive Carrier Selection (ACS), return carrier spacing down to 1.12x, multiple layers of header compression, and the most efficient IP encapsulation, with TDMA management that assures no wasted bandwidth.

- **Comprehensive IP Networking Features**
  SatLink® Hubs integrate feature rich IP routing & TCP & HTTP acceleration with VPN tunnelling, VLANs, & Virtual Satellite Networks (VSN) for multiple IP address spaces, as well as mesh networking control (with DVB-RCS).

- **Traffic Engineering, VNOs, & VSAT Groups**
  SatLink®’s traffic engineering enables cost-effective hub sharing by controlling bandwidth consumption and QoS policies of Virtual Network Operators (VNOs) for each of their VSAT Groups, without assigning hardware or dedicated carriers to particular VNOs.

- **Software-Defined RLS & FLS Platform**
  The FLS & RLS use SatLink®’s own software-defined modern platform optimised for processing IP packets and the DVB waveforms, using SatLink® firmware & software running on FPGAs & CPUs. They deliver many cost reductions and operational benefits, including: high-efficiency MODCODs, large TDMA carrier groups, fast-feedback ACM integrated with IP QoS, and custom configurations of carrier groups for maximum efficiency in burst-mode operation and space & power savings.

- **Advanced Traffic Shaping with QoS**
  Advanced traffic shaping on Forward and Return Links with four QoS classes meet the strict requirements for jitter and/or delay sensitive VoIP, video conferencing, video streaming, and time critical data applications.

- **Return SCPC Mode for Added Flexibility**
  An optional SCPC Mode enables the simplicity and spectrum efficiency as required for large high-capacity, dedicated trunks for an adaptable, complete solution.

- **ACM, ACS, & Rain Fade Mitigation**
  With Adaptive Coding and Modulation (ACM) applied on both Forward and Return Links and Adaptive Carrier Selection (ACS) on all TDMA carriers, the impact of rain fades is greatly mitigated, even in Ka band.

- **High-Availability for Maximum Uptime**
  Module redundancy using 1:1 or N:1 with fast failover. Geographic redundancy with multiple RF systems. SW updates on-the-fly. Uptimes can exceed 99.999%.

- **Comprehensive NMS & NCC Software**
  The database-driven SatLink® Network Management System (NMS) and the SatLink® Network Control Centre (NCC) software optimise network performance using close-loop control and simplify the configuration and provisioning of Hub modules, VSATs, VSAT Groups, carriers, VSNs, and VNOs. Support for multiple beams, across multiple satellites on multiple bands (C, Ku, Ka, EHF), including cross-strapped transponders, adds versatility and scalability.
### SatLink® Hub Feature Comparison

<table>
<thead>
<tr>
<th>Feature</th>
<th>9300</th>
<th>9400</th>
<th>9800</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Forward Link</strong></td>
<td>DVB-S2</td>
<td>DVB-S2</td>
<td>DVB-S2</td>
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<tr>
<td><strong>Return Link</strong></td>
<td>DVB-RCS2</td>
<td>DVB-RCS2</td>
<td>DVB-RCS2</td>
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<tr>
<td><strong>Forward Link ACM &amp; QoS</strong></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td><strong>Return Link ACM &amp; QoS</strong></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Max # of Beams</td>
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<td>10</td>
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<tr>
<td># of VSATs</td>
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<td>0-1000</td>
<td>0-50000</td>
</tr>
<tr>
<td>Redundancy</td>
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<td>N:1 or 1:1</td>
<td>N:1 or 1:1</td>
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<td>VNO</td>
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<tr>
<td>VSN (RCS2)</td>
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<td>✔</td>
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<tr>
<td>Return SCPC Mode</td>
<td>✔</td>
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<td>✔</td>
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<tr>
<td>TCP Acceleration</td>
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<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Accounting Support</td>
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<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Mesh Topology (RCS)</td>
<td>Optional</td>
<td>Optional</td>
<td>✔</td>
</tr>
<tr>
<td>TRANSEC (RCS2)</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Forward Automatic UPC</td>
<td>Half-Rack (22U)</td>
<td>1 to 2 Racks (42U)</td>
<td>1 to 3 Racks (42U)</td>
</tr>
<tr>
<td>Rack Space*</td>
<td>✔ (to 9400)</td>
<td>✔ (to 9800)</td>
<td>✔ (to 9800)</td>
</tr>
</tbody>
</table>

*Recommended rack space with room to grow. For a SatLink® 9800 Hub expecting 8 or more beams, 3 racks (42 U each) are recommended.

### SatLink® Open Hub Architecture

SatLink® Hub design uses the Open Hub Architecture with commercial off-the-shelf modules mounted in standard racks with high-capacity Gigabit Ethernet inter-connects. This enables scalability and re-configuration, while also allowing for integration of 3rd party products for value-added features. A full range of SatLink® Hub configurations are offered from small portable Hubs to carrier-class Hubs with 99.999% uptime. All configurations use a common set of modules.
SatLink® 8560 FLS

The SatLink® 8560 FLS enables DVB-S2 forward link TDM carriers at up to 45 Msps with ACM for up to 10,000 VSATs. It efficiently combines the functions of a DVB-S2 (or DVB-S) modulator with IP routing, IP encapsulation, and header compression at 20,000 IP packets per second.

ACM is implemented across all supported MOD-CODs with very low latency and integration with QoS policies per VSAT, at information rates up to 158 Mbps. Configurations with N:1 redundancy (N up to 5) are supported.

SatLink® 8560 RLS

The SatLink® 8560 RLS enables large DVB-RCS2 return link capacities by using up to 24 TDMA carriers, with each carrier in the range 125 kbps to 8 Msps, within a 40 MHz band using ACM per burst, at 1.12x carrier spacing. It is a combination of a DVB-RCS2 (or RCS) burst demodulator with IP packet re-assembly and header decompression at up to 20,000 IP packets per second.

The 8560 RLS handles up to 10,000 VSATs with two service classes each, or 5,000 VSATs with four service classes each. Configurations with N:1 redundancy (N up to 5) are supported. Multiple active RLS modules may be assigned to a single active FLS.

SatLink® NetAcc

(software on supplied SatLink® servers)

The SatLink® NetAcc software delivers high-performing TCP acceleration while also implementing IP routing, QoS policy enforcement, and traffic shaping, as well as optional user accounting and fair use policy control.

It supports up to 10,000 VSATs with 25,000 bi-directional accelerated TCP sessions, with up to 10 Mbps of TCP throughput in a single direction. Total capacity is rated at 150 Mbps on the supplied multi-core servers. Each NetAcc server supports multiple FLS/RLS. Configurations with N:1 redundancy (N up to 5) are supported.

SatLink® NMS & NCC

(software on supplied SatLink® servers)

The SatLink® 8560 RLS enables large DVB-RCS2 return link capacities by using up to 24 TDMA carriers, up to 8 Msps each, within a 40 MHz band using ACM per burst, at 1.12x carrier spacing. It is a combination of a DVB-RCS2 (or RCS) burst demodulator with IP packet re-assembly and header decompression at up to 20,000 IP packets per second.

The 8560 RLS handles up to 10,000 VSATs with two service classes each, or 5,000 VSATs with four service classes each. Configurations with N:1 redundancy (N up to 5) are supported. Multiple active RLS modules may be assigned to a single active FLS.