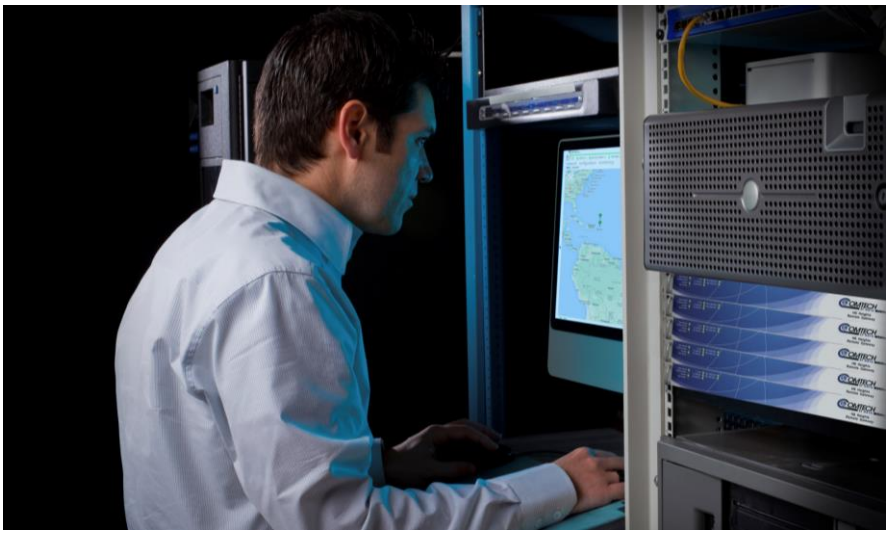
Heights™ Hubs
HEI Solo-Mini, HEI-Solo and HEI-VNO

Datasheet



Typical Users

- Oil & Gas
- Cruise and Cargo
- Corporate Enterprise
- Service Provider Multi-Tenant Environments
- Non-Governmental Organization (NGO)
- Mobile Network Operators
- Media
- Government
- Satellite Operators

Common Applications

- Maritime, Offshore & Mobility Communications
- Latency sensitive Business Applications
- IP Trunking & Internet Access
- Mobile Backhaul
- Satellite News Gathering
- Content Distribution Networks

Overview

The Heights™ Networking Platform is engineered to elevate your services with unparalleled horsepower, efficiency and intelligence. The features within the platform were designed with the service provider and its multi-tenant environments in mind, from concept to operation.

Heights combines our most efficient waveforms, header and payload compression engines, WAN optimization, proven dynamic bandwidth and power management along with bi-directional ACM capability to provide the highest user throughput, highest availability, and most optimal resource utilization available in the industry.

The Heights Networking Platform meets the demands of those operating on traditional wide beams while providing distinct advantages for those with High Throughput Satellites (HTS) in their futures. Heights is HTS ready, providing the lowest cost highest throughput solution for feeder link teleports supporting fixed or remote terminals, scaling from tens to thousands of sites economically.

Three hub configurations are offered:

- Heights Solo-Mini – Single network hub with single outbound carrier and shared bandwidth pool for inbound connections, for small private networks
- Heights Solo – Single network hub with single outbound carrier and shared bandwidth pool for inbound connections
- Heights VNO – Multi-network hub with multiple outbound carriers along with multiple associated shared bandwidth pools for inbound connections
- Custom hub configurations are also available

Heights Dynamic Network Access (H-DNA)

H-DNA is an evolutionary dynamic network access technology designed for Heights return links that:

- Rapidly adapts to changing environments
- Delivers superior efficiency & Quality of Experience (QoE)
- Instantly assigns capacity based on network-wide demand
- Intelligently utilizes total network bandwidth at all times

24/9 Powells Road, Brookvale, NSW 2100, Australia
+61 2 9939 4377 sales@stepelectronics.com.au

Multi-Layer Optimization

The multi-tier optimization in the Heights Networking Platform provides the highest spectral and power efficiency in its class – delivering highest user IP bits per Hz and user IP bits per Amplifier Watt. This multi-layer approach includes:

Comtech's DVB-S2X and Efficiency Boost (EB) Outbound – waveforms achieve a 10% – 35% increase in efficiency over the DVB-S2 standard without an increase in power or occupied bandwidth.

VersaFEC-2 on Inbounds – the VersaFEC-2 high-performance LDPC FEC method was specifically designed to optimize application and RF performance. VersaFEC-2 High Rate provides 38 ModCods (BPSK to 32-ARY) with performance generally better than DVB-S2 at significantly lower latency and VersaFEC-2 provides 36 ModCods (BPSK to 32-ARY). All higher order constellations are quasi-circular for optimal peak-to-average performance.

Bi-Directional ACM – provides a significant increase in throughput and availability as it converts fade margin into increased capacity, making it possible to more than double the throughput for Ku-band operation, even under deep fade. Unlike other satellite networking platforms, Heights leverages ACM in both directions, ensuring that both directions of links are optimized based upon weather, beam location and antenna size.

Dynamic Bandwidth Allocation – the dynamic bandwidth allocation engine of the Heights solution resizes and can move the center frequency of inbound SCPC carriers based upon user-defined policies. The dynamic bandwidth allocation engine manages the return bandwidth pools, acting upon an automatic switching request that is initiated by a remote in response to traffic load or protocol classification of inbound traffic.

IP Header and Payload Compression – a highly robust lossless compression engine and IP header compression technique operate in conjunction to significantly reduce the total amount of data that need be transmitted over the satellite, creating a significant increase in user IP throughput for a given satellite resource. The hardware-based payload compression engine leverages industry-leading GZIP-based compression with session management for maximum compression, typically reducing required satellite bandwidth by 30-40% while software compresses Ethernet, IP, UDP, TCP and RTP headers. For a VoIP call the typical 54 byte Ethernet/IP/UDP/RTP header is reduced from 54 bytes down to as little as 1 byte, creating up to 75% additional savings. This combination ensures mission-critical application integrity while driving maximum net efficiencies.

Advanced Multi-Tier QoS – the advanced multi-tier QoS mechanism of the Heights platform performs traffic shaping while ensuring the highest quality service with minimal jitter and latency for real-time traffic, priority treatment of mission critical applications and maximum bandwidth efficiency.

NetVue™ Integrated Management System (NMS)

A state-of-the-art NMS is critical to operating a shared multi-user platform that supports multiple business models in a cost-effective manner. The Heights leverages the powerful NetVue Integrated Management System as a single front-end of multiple networks to observe and modify elements throughout all customer networks. In addition, NetVue provides tiered access levels that allow a network operator to provide Virtual Network Operator (VNO) monitor and control access to a number of different service providers for their own partition of the platform.

NetVue is a robust, comprehensive network management and analytics engine that allows users to intelligently maximize resource utilization, ensure network uptime and meet Service Level Agreements (SLAs) while maximizing Quality of Experience (QoE).

It has the power of an intuitive graphical user interface (GUI) for real-time data gathering, trend analysis, alarm management, dashboard reporting and analysis, notification, and advanced applications for reporting, automation, spectrum analysis and event correlation.

This powerful GUI dynamically presents the managed network in multiple views, including map view, site views, rack diagrams, and Key Performance Indicators. In addition, NetVue offers advanced applications for automation, scheduling, monitoring, reporting and spectrum analysis. For additional detail, refer to the NetVue datasheet.

Seamless Bridge Point-to-Multipoint (BPM) Operation

The Heights Networking Platform operates in BPM mode to provide true layer 2 operation. To a service provider's network, the entire Heights network is viewed as an Ethernet switch while benefiting from a bi-directional multi-tier QoS with VLAN ID classification.

Global IP Roaming

Global IP roaming enables a satellite terminal on-board a mobile platform to seamlessly transition between satellite beams or hub coverage with minimal service interruption. Each remote gateway includes an embedded mobility controller that interfaces with the Antenna Control Unit (ACU), maintains satellite footprint maps and initiates beam switching and handoff as the vessel moves through the satellite footprint. It offers a common management interface for the mobility server and the ACU by providing a set of commands, information, interfaces and status queries.

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WAN Optimization

Heights WAN optimization includes TCP / http acceleration, persistent TCP connections, image smoothing, DNS caching and object caching and significantly improves user's web browsing experience over higher latency satellite links while reducing the amount of required bandwidth.

It also enables web and other TCP applications to fully utilize all available bandwidth. WAN optimization uses FX-4010C Application Delivery Controller (ADC) at the hub. All Heights remotes incorporate embedded WAN optimization. WAN optimization is fully integrated with multi-tier QoS, ACM and IP optimization for maximum performance and efficiency.

Dynamic MESH

Heights supports dynamic remote-to-remote connections (MESH) in router mode with Dynamic SCPC (dSCPC), using additional receivers at the remote. Dynamic MESH requires "loop-back" operation where each site in a MESH connection is able to receive from all other sites in that MESH connection. Dynamic MESH eliminates double hop latency as remote-to-remote packets don't have to transit through the hub. It also requires 50% less bandwidth as a remote-to-remote double hop link would consume almost twice the bandwidth.

Comtech Network Planning Tool (CNPT)

The CNPT is a comprehensive "toolkit" that analyzes different network architecture design options and generates budgetary designs along with total traffic efficiency, allowing the user to select the most optimal solution prior to network rollout. Powered by a combination of Google Maps, SatBeams and the SatMaster LBA core, CNPT allows a user to conduct multiple iterative analyses quickly, modifying traffic patterns and assignments to determine how each modification in traffic and/or network design affects the network's efficiency and resulting economics, CNPT consists of two tools that work in tandem, one focused on traffic planning and another focused on overall network planning.

Traffic Planning Tool – Allows user traffic entry along with the assignment of traffic types to different remotes throughout a network. Generates the overall traffic efficiency, including resulting compression efficiency gains, of each unique design to allow a user to determine the most optimal design for a particular traffic flow.

Network Planning Tool – Allows a comprehensive analysis of the entire network and allows proper hub and remote design. Transmission planning and link budget tools allow a user to generate total network outbound and inbound efficiencies in summary form.

Engineering Support Services (ESS)

ESS is our premium service, supporting the design, implementation and ongoing optimization of the Heights integrated satellite network infrastructure. Offering 24x7 engineering support before, during and after network rollout, the ESS Prime service is backed by a team of seasoned satellite network engineers who have designed, implemented and optimized networks around the world, and leverage this expertise daily to lead users to the best network solution.

Benefits

- Designed from the ground up for the service provider; seamless integration with existing IT infrastructure
- Highly scalable platform able to support multiple business models simultaneously with networks ranging from a few sites to thousands of sites
- Seamless layer 2 operation with VLAN support simplifies "plug-n-play" integration with provider infrastructure and maintains traffic separation among users
- Advanced multi-tier QoS to support the service provider environment of diverse end users operating in a multi-tenant environment
- Intelligent NetVue NMS provides insight required to operate the network optimally, maximizing resource utilization and enhancing profitability
- Allows a network operator to support a number of different business models, including VNO and co-location
- Comtech Network Planning Tool seamlessly integrates with the NetVue NMS to port configurations from planning to operations
- ESS Prime service provides 24x7 consultation to ensure optimal design, implementation and operation
- Bi-directional ACM enables optimal operation and highest network availability under all conditions, especially for on-the-move applications
- Dynamic bandwidth and power management provide optimal resource utilization achieving highest user throughput for available bandwidth and power
- High-performance multi-core packet processing enables the most demanding services to be supported while providing the highest throughput abilities in the industry
- WAN optimization improves user QoE while saving bandwidth
- Maximizes Quality of Experience (QoE) by providing the best support of mission-critical business applications that require the lowest latency and jitter possible

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Hub Configuration Feature Comparison

	HEI – VNO / HEI – CUSTOM	HEI – Solo	HEI – Solo-Mini
Factory integrated rack	√	√	√
Multi-network / multi-satellite capable	√	Single network	Single network
Highly scalable with ability to support thousands of terminals	√	√	√
Carrier grade platform with high availability	√	Redundancy Options	No Redundancy
Intelligent network and bandwidth management	√	√	√
Dynamic bandwidth management supporting sharing of multiple bandwidth pools	Multiple transponders and satellites	Single transponder with multiple bandwidth pools	Single transponder with multiple bandwidth pools
VNO capability	√	Limited capability	Single network

Up to 150 Msps shared outbound per network
• Up to 700 Mbps IP throughput with optimization
• DVB-S2X Waveform
  ○ QPSK, 8PSK, 16APSK, 32APSK, 64APSK
• Comtech EF Data's Efficiency Boost Waveform
  ○ QPSK, 8PSK, 16APSK, 32APSK
• 5% rolloff
	√	√	√

H-DNA or Dynamic SCPC return with >200 Mbps user IP throughput per terminal • VersaFEC-2 • BPSK, QPSK, 8-ARY, 16-ARY, 32-ARY • 5% rolloff	√	√	√
Bi-directional ACM	√	√	√
Hardware-based payload compression	√	√	√
L2/L3/L4 Header compression	√	√	√
Multiple uplink and downlink	√	1 uplink and downlink	1 uplink and downlink

Key Subsystems

Below is a summary of the key subsystems that are integral to the hub configurations along with a summary of the number of each subsystem included in a Starter Kit.

Subsystem	Description	HEI – VNO Starter Kit	HEI – Solo Starter Kit	HEI – Solo-Mini
HTX-450	Modulator supporting up to 150 Msps outbound carrier	2 (1:1 configuration)	1	1
HTO-1	Traffic optimization server, ACM controller	2 (1:1 configuration)	1	1
HRX (H-DNA)	Multi-channel receiver with user selectable software defined profiles • High Rate Profile supports 1 demod up to 45 Msps and 8 demods up to 15 Msps ea. • Standard Rate Profile supports up to 12 demods, up to 15 Msps each • Lite Profile supports up to 24 demods, up to 5 Msps each	2	1	1
HRX-16 (dSCPC)	48 channel receiver supporting up to 16 Mbps IP throughput per channel subject to symbol rate, MODCOD and optimization	2 (or HRX-64)	1 (or HRX-64)	1 (or HRX-64)
HRX-64 (dSCPC)	12 channel receiver supporting up to 64 Mbps IP throughput per channel subject to symbol rate, MODCOD and optimization	2 (or HRX-16)	1 (or HRX-16)	1 (or HRX-16)
HSV1.BWM	Server with bandwidth manager	1:1	0	0
HSV1.NV	Server with NetVue NMS	1:1	0	0
HSV1.DUO	Server with NetVue NMS and bandwidth manager	0	1	1
FX-4010c	WAN Op Server (optional)	Optional	Optional	Optional

Hub Receiver Compatibility

	H8	H16	H-Pro
Compatible Hub Receiver (H-DNA)	HRX (Standard Profile or Lite Profile)	HRX (Standard Profile or Lite Profile)	HRX
Compatible Hub Receiver (dSCPC)	HRX-16 & HRX-64	HRX-16 & HRX-64	HRX-64

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Specifications

HTX-450 Hub Modulator

Maximum WAN Data Rate	500 Mbps, subject to symbol rate & MODCOD (With optimization, IP throughput up to 700 Mbps)
Symbol Rate	1 – 150 Msps
FEC	DVB-S2X & Comtech's Efficiency Boost
Modulation	DVB-S2X: QPSK, 8PSK, 16APSK, 32APSK, 64APSK Efficiency Boost: QPSK, 8PSK, 16APSK, 32APSK
Operating Frequency	50 to 180 MHz, or 950 to 2150 MHz, 100 Hz resolution
Transmit Filter Rolloff	5%, 10%, 15%, 20%, 25%, 35%

HTO-1 Traffic Optimizer

Traffic Modes	Switched (BPM), or Static Routing
ACM/VCM	Integrated ACM/VCM controller
Multi-Tier QoS	
Capacity Groups	Up to 20 per Outbound
QoS Groups	Up to 100 per Capacity Group
QoS Rules	Up to 32 per QoS Group
Header compression	Ethernet (incl. VLAN & MPLS tags), IP, IP/UDP, IP/UDP/RTP, TCP/IP
Payload compression	Lossless Payload Compression GZIP)
Multicast Throughput	Up to 35 Mbps total for all multicast streams

HRX Multi-Channel Receiver (H-DNA)

Demodulators per 1RU	User selectable software defined profiles • High Rate Profile supports 1 demod up to 45 Msps and 8 demods up to 15 Msps ea. • Standard Rate Profile supports up to 12 demods, up to 15 Msps each • Lite Profile supports up to 24 demods, up to 5 Msps each
User IP Data Rate	IP throughput per channel subject to symbol rate, MODCOD and optimization
Symbol Rate (Each Demodulator)	Up to 5, 15, or 45 Msps profile dependent (Minimum 42.275 ksps for BPSK/QPSK, 60 ksps for 8-ARY, 100 ksps for 16-ARY and 250 ksps for 32-ARY)
WAN Data Rate (Each Demodulator)	Up to 200 Mbps (Modulation and FEC dependent)
FEC	VersaFEC-2 High Rate, VersaFEC-2
Operating Frequency	950 to 2150 MHz, 100 Hz resolution
Operating Bandwidth	All carriers within 70 MHz
Connector	Type N (female), 50 Ω
Input Power Range, Desired Carrier	-122 + 10 log (symbol rate) to -102 + 10 log (symbol rate) dBm
Rolloff	5%, 10%, 15%, 20%, 25%, 35%

HRX-64 Multi-Channel Receiver (dSCPC)

Demodulators per 1RU	12
User IP Data Rate	Up to 64 Mbps IP throughput per channel subject to symbol rate, MODCOD and optimization
Symbol Rate (Each Demodulator)	Up to 15 Msps (Minimum 42.275 ksps for BPSK/QPSK, 60 ksps for 8-ARY, 100 ksps for 16-ARY and 250 ksps for 32-ARY)
WAN Data Rate (Each Demodulator)	Up to 40 Mbps (Modulation and FEC dependent)
FEC	VersaFEC-2 High Rate, VersaFEC-2
Operating Frequency	950 to 2150 MHz, 100 Hz resolution
Operating Bandwidth	All carriers within 70 MHz
Connector	Type N (female), 50 Ω
Input Power Range, Desired Carrier	-122 + 10 log (symbol rate) to -102 + 10 log (symbol rate) dBm
Rolloff	5%, 10%, 15%, 20%, 25%, 35%

HRX-16 Multi-Channel Receiver (dSCPC)

Demodulators per 1RU	48
User IP Data Rate	Up to 16 Mbps IP throughput per channel subject to symbol rate, MODCOD and optimization
Symbol Rate (Each Demodulator)	Up to 5 Msps (Minimum 42.275 ksps for BPSK/QPSK, 60 ksps for 8-ARY, 100 ksps for 16-ARY and 250 ksps for 32-ARY)
WAN Data Rate (Each Demodulator)	Up to 10 Mbps (Modulation and FEC dependent)
FEC	VersaFEC-2
Operating Frequency	950 to 2150 MHz, 100 Hz resolution
Operating Bandwidth	All carriers within 70 MHz
Connector	Type N (female), 50 Ω
Input Power Range, Desired Carrier	-122 + 10 log (symbol rate) to -102 + 10 log (symbol rate) dBm
Rolloff	5%, 10%, 15%, 20%, 25%, 35%

Power

HEI-VNO & HEI-Solo	110 – 230 VAC, DC (HW Option)
HEI-Solo-Mini	110 – 230 VAC

Environmental

Operating Temperature	10ºC to 35ºC
Operating Humidity	20% to 80%

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