UNIVERSAL HARDWARE PLATFORM

CARRIER-GRADE VSAT TECHNOLOGY

JANUARY 2019 (Revision 3.5X)
UHP NETWORKS AT A GLANCE

- Developer and manufacturer of industry’s first software-defined, high-throughput VSAT technology with best total cost of ownership
- Head Office in Montreal, Canada; manufacturing in EU and Canada; sales and support offices around the world
- Installed 370 networks and 40,000 remote terminals, operated by Tier-1 telecom and utility companies, major broadcasters in over 50 countries
WHY USE UHP?

- **One-for-all** technology: Software-Defined Functionality
- **Made for HTS** VSAT with support of multiple beams and frequency bands
- Efficient **DVB-S2X** MODCODs and highest **TDMA efficiency**: 96%
- **Mesh** capability: eliminate double bandwidth allocation due to double hop
- Layer 3 routing architecture and **Layer 2** bridging mode
- Superior IP router **productivity** and rich set of supported protocols with **QoS**
- NMS with support of **VNO** and **API** for interfacing with OSS/BSS, etc.
- **Smallest**, lowest power consumption, most **reliable** IDU
- The most versatile and lowest-cost hub with **M:N local/geo-redundancy**
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DISRUPTIVE INNOVATIONS
SOFTWARE DEFINED NETWORK

- Universal routers for all network roles
- Dynamic SW-definable mode of operation
- Quick and easy transfer/swap of the functionality SW licenses
- Reduced CAPEX for spare parts and network upgrades
- Quick and easy field replacement and change of network topology

- Powerful L3/L2 router with 190’000 pps
- Mesh: eliminate double bandwidth allocation
- Multiple configuration profiles
- Embedded Computer for advanced applications and traffic processing
- Sophisticated QoS with VLAN management and built-in 2G, 3G & LTE backhaul optimization
BANDWIDTH EFFICIENCY

- Dual DVB-S2X demodulators with separate IF inputs
- Up to 500 Msps DVB-S2X ACM up to 256APSK
- Integrated high-speed DVB-S2X modulator for SCPC return channel
- Proprietary encapsulation with 99% efficiency and advanced QoS
- Up to 20% savings on bandwidth

- Multichannel MF-TDMA LDPC demodulator
- 12 MODCODs with QPSK, 8PSK & 16APSK
- Data rates up to 27 Mbps/terminal
- Hubless and Mesh topologies
- Highest TDMA efficiency of 96% and flexible frame structure
- >20% advantage over other TDMA implementations
MULTI-SPOT HTS HUB

- Designed for multi-spot HTS networks
- Based on low-CAPEX universal controllers
- Required functionality is activated by SW license as network develops
- Easy SW license transfer between teleports, beams and satellites
- Cost-effective scalability up to 64 spot-beams and 500 000 terminals
- Self-healing network architecture
- Dynamically assigned network roles
- Automatic M:N local and geographic redundancy
- M:N site diversity with multiple teleports for increased availability
- Saves over 40% of Hub CAPEX due to functionality SW license reuse
DUAL-GATEWAY

- Hierarchical multilevel topologies with basic STAR terminals
- Direct connectivity of the terminal with the Hub and respective Gateway
- Unlimited number of regional Gateways
- High spectral efficiency of all TDM channels of the Hub and Gateways
- Compatible with multi-sport HTS satellites and dual-band solutions
- Dual-Gateway ensures more than 50% savings compared to Mesh network
BEAM SWITCHING

- Preconfigured, locally-stored coverage maps and network parameters
- Automatic round-robin and map-based switchover between satellites or beams
- Change of mode of operation when required
- Automatic adjustment of uplink power and Doppler effect compensation up to 1300 km/h
- Communications with mobile antenna based on standard OpenAMIP protocol
- COTM terminal retains the same IP address after switchover to another hosting network
QUALITY OF SERVICE

- Classification of IP packets
- Customized action rules
- Traffic policy manager
- Multichannel hierarchic traffic-shaper:
  - CIR – committed data rate
  - MIR – maximum data rate
  - MIR to CIR slope factor
  - Day/Night CIR change
- Multiple Tx priority queues with Class-Based Queueing
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SATELLITE ROUTERS
UHP-100 SERIES
LOW-COST SATELLITE ROUTER

- Forward Channel: receive up to 500 MspS DVB-S2X ACM with modulations up to 256APSK
- Two independent DVB demodulators with separate IF inputs
- Return Channel: MF-TDMA 100 kspS ... 8 MspS LDPC ACM with QPSK, 8PSK and 16APSK
- Superior throughput and processing capability up to 150’000 pps
- Built-in adaptive hierarchic traffic shaper and advanced QoS management
- Two Fast Ethernet user ports and switch
UHP-200 SERIES
UNIVERSAL SATELLITE ROUTER

• Forward Channel: up to 500 MspS DVB-S2X ACM with modulations up to 256APSK
• Two independent DVB demodulators
• Return Channels:
  • 4-channels MF-TDMA 100 kspS ... 8 MspS LDPC ACM with QPSK, 8PSK and 16APSK
  • SCPC up to 65 MspS DVB-S2X ACM with QPSK, 8PSK, 16APSK, 32APSK and 64APSK
• Superior processing capability up to 190'000 pps
• TDM/TDMA Star&Mesh, SCPC and TDMA Hubless
• Built-in adaptive hierarchic traffic shaper and QoS
• Switch with two Gigabyte Ethernet user ports
UHP-231
INTELLIGENT ROUTER

- Standard UHP-230 router
- Embedded Edge Application Computer (EAC) for:
  - Cellular backhaul optimization
  - Enhanced IP traffic optimization and acceleration
  - Specialized software for M2M and IoT equipment
  - Proprietary customer’s applications
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TDM/ TDMA HUB
**UHP TDM/TDMA HUBs**

**Mini HUB**
- Single Satellite
- One Forward Channel
- MF-TDMA Return Channels
- Permanent SW licenses
- Up to 2000 terminals

**Standard HUB**
- Multiple Satellite
- MF-TDMA and SCPC Return Channels
- Permanent SW licenses
- Up to 500k terminals

**HTS HUB**
- Up to 64 HTS spot-beams
- MF-TDMA and SCPC Return Channels
- Dynamic SW licenses
- Smart Redundancy
SCALABLE HUBs

- TDMA carriers: 1
  - Terminals: 2000
  - IC Rate: 27 Mbps

- TDMA carriers: 4
  - Terminals: 2000
  - IC Rate: 27 Mbps

- TDMA carriers: 8
  - Terminals: 4000
  - IC Rate: 54 Mbps

SW key for multi-channel TDMA demodulator

And so on...
Up to 252 TDMA Return Channels or MF groups per Forward Channels

... and so on... Up to 252 TDMA Return Channels or MF groups per Forward Channels
STANDARD HUB

- Scalable design: up to 64 FWD, 252 RTN channels per FWD and 500k terminals
- Independent IF interface for each FWD and associated RTN links
- FWD: TDM up to 65 Msps DVB-S2X ACM QPSK - 64APSK
- RTN: MF-TDMA up to 8 Msps LDPC ACM with QPSK, 8PSK and 16APSK
- RTN: SCPC up to 65 Msps DVB-S2X ACM up to 64APSK
- 5% & 20% roll-off for TDM, SCPC and TDMA
- Smart bandwidth distribution every 30-100 ms
- Rich set of supported protocols with QoS, acceleration and compression
- Hot-standby 1:1 local redundancy
HTS HUB

- Multi-spot, multi-band, self-healing, enterprise-class VSAT Hub
- Scalable design: up to 64 FWD, 252 RTN channels per FWD
- Universal controllers with dynamic SW licenses assignment
- Required functionality is activated by SW license as network grows
- FWD: TDM up to 500 Mps DVB-S2X ACM QPSK - 256APSK
- RTN: MF-TDMA up to 8 Mps LDPC ACM with QPSK, 8PSK, 16APSK
- RTN: SCPC up to 65 Mps DVB-S2X ACM up QPSK - 64APSK
- 5% & 20% roll-off for TDM, SCPC and TDMA
- M:N local and geographical Smart Redundancy / Site-Diversity
HTS HUB
SMART INVESTMENTS

Minimal cost of expansion
Effective local-/geo-redundancy
All features are enabled

Significant cost of HTS NMS
All controllers are bound to NMS
HTS Hub cannot be split

UHP HUBs PRICING

Significant savings for redundant and/or multi-spot HTS Hubs

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<th>10C/1IC 1:1 red.</th>
<th>10C/2IC no red.</th>
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<td>-40%</td>
<td>-6%</td>
<td>-49%</td>
<td>-24%</td>
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<td>Standard</td>
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<td>-40%</td>
<td>-6%</td>
<td>-49%</td>
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HUB REDUNDANCY

- UHP routers support Base and intelligent Smart Redundancy
- Base redundancy provides 1:1 backup configurations and requires double set of equipment
- Smart Redundancy is intelligent NMS-controlled system that dynamically assigns network roles to universal controllers
- UHP Smart Redundancy saves over 35% of Hub CAPEX due to dynamic SW license reuse

Abbreviations (roles):
OC – Forward channel controller
IC – Return channel controller
SMART REDUNDANCY
LOCAL-/GEO- REDUNDANCY AND SITE DIVERSITY

- Smart Redundancy NMS dynamically assigns network roles to universal controllers of the Active Teleport and ensures the highest service availability.
- If no more universal routers available for system failover on the Active Teleport, the Smart Redundancy moves all network roles to the Standby Teleport.
- Smart Redundancy avoids service degradation caused by rain fade by automatic switchover of the Teleports depending on the current atmospheric conditions.
- Smart Redundancy supports M:N Redundancy and Site Diversity configurations, while uses just one set of SW licenses and ensures tremendous CAPEX savings.
NETWORK MANAGEMENT SYSTEM

- Support of multiple networks with different satellites or modes of operation
- Multiuser VNO access to divide global network infrastructure
- Full details on status, alarms, levels, traffic, terminals activity, weather conditions, etc.
- API interface to external OSS/BSS systems
- Group management and scheduled firmware update of network terminals
- M:N Local- and Geo-Redundancy of Hubs
AUTO-COMMISSIONING

- Streamlines the pointing and commissioning
- Smartphone-based tool, assisting the installer
- Integrated compass and inclination tool
- Fast and accurate pointing to the satellite
- Cross-polarization (CPI) nulling
- 1dB compression point automated calculation
- High scalability: for small and large networks
- Compatible with all modes of UHP routers
- Standard solution (GVF514 training course)
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ENTERPRISE NETWORKS
WHY USE UHP FOR ENTERPRISE NETWORKS?

- **One-for-all** technology: Software-Defined Functionality
- Highest **transmit capability** from remote: 225 Mbps
- Smallest, lowest power consumption, most **reliable** IDU
- **AES-256** encryption of user data and network management
- NMS with **API** for interfacing with OSS/BSS, etc.
- **Mesh** capability: eliminate double bandwidth allocation due to double hop
- **VNO** capability with hierarchical traffic shaper
- **QoS**: support for **VoIP** with cRTP header compression + **Video** over TDMA
- High availability: **Local-/Geo- Redundant** Teleports with Fast switchover
OFFICE CONNECT AND BUSINESS CONTINUITY

- Broadband connectivity for primary and offload/backup lines to regional offices
- The same level of access and enterprise applications for all remote employees
- Efficient voice and video collaboration and M2M data transmission in one network
- High-throughput terminals with burstable TDMA or dedicated SCPC channels
- Various QoS levels and support of VoIP, videoconferencing, IP multicast, etc.
- Content delivery (training, software etc.)
BANKING AND FINANCE

- Seamless communications for remote branches, trade machines and mobile offices
- Secure and reliable infrastructure for critical financial transactions
- Voice and video connection with remote branches for collaboration and training
- Corporate TV and dynamic digital signage
- Surveillance video for all branches
- Two-way terminals with burstable TDMA or dedicated SCPC channels for backup
ENERGY & UTILITY

- Reliable communications for rigs, vessels, pipelines and remote offices
- One network for business applications, SCADA traffic, surveillance and crew welfare
- Efficient capacity use and burstable throughput thanks to dynamic bandwidth allocation
- Real-time transmission for critical data and remote management
- High scalability and flexible topologies
- Autonomous terminals with low power consumption and suspend mode for SCADA
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SATELLITE BACKHAUL
UHP SATELLITE BACKHAUL SOLUTION

Capabilities

• Software-defined network (SDN)
• Support for different standards
• Seamless global coverage
• High-speed connectivity
• Flexible topology and waveforms
• Efficient use of satellite bandwidth
• Easy to deploy, reliable equipment

Advantages

✓ Reduce backhaul costs
✓ Increase revenue and profitability
✓ Improve network performance
✓ Launch new services
✓ Penetrate to new regions
✓ Easy future enhancements
✓ Backup for terrestrial backhaul
WHY USE UHP FOR CELLULAR BACKHAUL?

- **Scalability**: start with a SCPC link and SW migrate to a TDM/TDMA network
- **DVB-S2X bandwidth-efficient** modulation and coding
- Highest **TDMA efficiency**: 96% and fast BW allocation
- Highest **transmit capability**: 450 Mbps aggregate
- Extremely high processing capability up to **190K PPS**
- Robust **L2** interface can carry Metro Ethernet traffic, as well as **Layer 3**
- NMS with XML-based **API** for easy integration with OSS/BSS
- Sophisticated **QoS** with built-in 2G, 3G & LTE **backhaul optimization**
- **Field proven** with major Mobile Network Operators in the USA
SATELLITE BACKHAUL

UHP NETWORK DIAGRAM

- 3G Iuh & LTE S1 Decoding and Encoding
- Optimization & Offload
- TCP Acceleration
- DVB-S2X modulations
- Adaptive coding and modulations
- Various waveforms
- Any network topologies

Supported waveforms:
- SCPC P2P
- TDM/SCPC
- TDM/TDMA

Mobile Network Operator’s BSC/RNC/EPC

Abis/Iub/Iuh/S1

RAN Optimizer

Ethernet

UHP HUB

UHP

2G BTS

2G Abis

3G NodeB

3G luh

LTE eNodeB

LTE S1

UHP
SCPC vs TDMA

SATELLITE BACKHAUL DILEMMA

SCPC:
- Dedicated bandwidth
- High MODCODs
- Low latency and jitter

TDMA:
- Bandwidth sharing
- Statistic multiplexing
- Burstable throughput

Find the middle ground: use both
- TDM forward channel with CIR and QoS with unlimited MIR
- MF-TDMA return channels with data rate up to 27 Mbps per carrier and 96% efficiency vs SCPC
- Dedicated SCPC or on-demand SCPC-DAMA return channels up to 225 Mbps with up to 64APSK
- SW-controlled switchover between SCPC and TDMA waveforms
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COMMUNICATION ON THE MOVE
UHP COTM

Capabilities
• Support for different antennas
• Seamless global coverage
• High-speed connectivity
• Flexible topology and waveforms
• Efficient use of satellite bandwidth
• Easy to deploy and operate
• Reliable equipment with redundancy

Advantages
✓ Scalable solutions applicable for fishing boats, SNG and cruise ships
✓ Meets demands of the most complex mobility applications
✓ Reliable broadband access for the crew and passengers everywhere
✓ Efficient multiservice VSAT platform for fixed and COTM terminals
WHY USE UHP FOR COTM?

- Bandwidth-efficient **DVB-S2X** modulation and coding
- Highest **TDMA efficiency**: 96% and fast BW allocation
- Support for cellular backhaul 2G/3G/LTE traffic for wireless roaming onboard
- **OpenAMIP** and other proprietary protocols to interface with mobile antennas
- Automatic **beam switching** with change of frequencies and mode of operation
- Support for multi-spot **High-Throughput Satellites**
- **Doppler effect** compensation up to 1300 km/h speeds
- Compact, light-weight, low-power **router board for integration** into antennas
COMMUNICATION ON THE MOVE
TDM/SCPC MULTI-SPOT NETWORK

- Dedicated SCPC channels to each ship
- MODCODs up 64APSK in both directions
- Data rates up to 225 Mbps duplex
- Shared forward (TDM) channel with statistical traffic multiplexing and advanced QoS
- Requires forward TDM channel and capacity for SCPC return channels in each spot-beam
- Automatic beam switching
- Recommended for networks with a small number of terminals and very intensive traffic, e.g. cruise ships with Tx traffic above 10 Mbps
COMMUNICATION ON THE MOVE
TDM/TDMA MULTI-SPOT NETWORK

○ Forward (TDM) channel with DVB-S2X MODCODs and up to 225 Mbps throughput
○ MF-TDMA return channel with MODCODs up to 16APSK and throughput up to 27 Mbps/carrier
○ Requires TDM/TDMA subnetwork in each spot-beam of the target coverage
○ Supports automatic beam switching with TDM/TDMA or TDM/SCPC network topologies
○ Recommended for networks with multiple terminals and modest traffic in return channel, e.g. cargo/small ships, airplanes, SNG vehicles
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MISSION-CRITICAL APPLICATIONS
SUMMARY OF B2G REQUIREMENTS

- Universal Functionality & Topology
- Bandwidth Efficiency and Performance
- HTS Compliant Architecture
- Multipurpose Terminals
- Traffic and Management Security
- Mobility and Portability
- Superior Reliability and Availability
- Localization Options
WHY USE **UHP** FOR MISSION-CRITICAL APPLICATIONS?

- **One-for-all** technology: Software-Definable Satellite Router
- Ready for integration with **manpack** antenna systems
- **Ultra-fast start** and extended operational temperatures
- **Ruggedized outdoor Hub** for field-deployable networks
- Support of C-, X-, Ku- and Ka-bands, including **HTS**
- **Mesh** capability: eliminate double bandwidth allocation
- **QoS**, support for VoIP and Video over TDMA with controlled jitter
- **Ultra-low latency** VSAT system with round-trip delay about 570 ms for TDMA
- Support of **OpenAMIP** and other protocols to interface with mobile antennas
AIR TRAFFIC CONTROL

- Reliable connectivity for flight controllers
- Support of real-time data, voice and video
- Single-hop Full-Mesh TDMA topology
- Round-trip delay below 570ms
- Dynamic bandwidth allocation
- Single-carrier or MF-TDMA network
- Efficient modulations and ACM
- 1:1 automatic redundancy of terminals
- No single point of failure
BORDER CONTROL & EMERGENCY RELIEF

- Fixed, fast-deployable and mobile terminals
- Support of real-time data, voice and video
- Backhaul for fast-deployable cellular networks
- Dynamic TDMA bandwidth allocation
- Star, Multilevel or Mesh topologies
- Dedicated and on-demand SCPC channels
- Efficient modulations and ACM
- Secure AES-256 encryption of traffic
- 1:1 automatic redundancy of terminals
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MEDIA NETWORK
WHY USE UHP FOR MEDIA NETWORKS?

- Universal network for content **contribution and distribution**
- High-speed **DVB-S2X broadcasting** up to 225 Mbps
- Powerful **IP router** with Gigabit Ethernet ports
- Dynamic **bandwidth allocation** for DSNG transmissions
- **Mesh** capability: eliminate double bandwidth allocation
- **QoS**, support for VoIP with cRTP header compression, Video over TDMA with controlled jitter, TCP acceleration
- **Ultra-low latency** VSAT system with round-trip delay about 570 ms for TDMA
- Best network availability: **Local-/Geo- Redundant** Teleports
IP BROADCAST AND CONTENT DELIVERY

- Live, on-demand or offline content broadcasting for IPTV headend stations
- Secure and reliable content delivery to digital cinema theaters
- Data throughput up to 225 Mbps per channel
- Bandwidth-efficient DVB-S2X modulations
- Delivery via AES-256 encrypted channels
- Rx-only receivers or two-way terminals for interactive applications with dual demodulators
SATELLITE NEWS GATHERING

- High-speed video streaming and two-way voice/data from hard-to-access locations
- Dynamic satellite bandwidth allocation for SD, HD or Ultra-HD transmissions
- Shared 27 Mbps MF-TDMA or dedicated 225 Mbps SCPC carriers on demand
- Support of OpenAMIP and other proprietary protocols to interface with mobile antennas