

The U9000 is a telco grade VSAT satellite modem for open edge computing applications such as MEC (Multi-access Edge Computing / Mobile edge Computing), SD-WAN (Software Defined WAN), NFV (Network Function Virtualization) and rural / remote service provisioning.

The U9000 satellite modem provides telecom operators, MNOs and service providers the infrastructure for delivering tailored, smart and cost effective applications and processing power to the edge.



## Features and Benefits

- Built-in powerful open server computing platform for customer-own applications:
  - Cellular open-RAN MEC deployment with satellite link as primary or secondary link allowing caching, CDN and other solutions.
  - Industrial IoT satellite link with edge aggregation and processing.
  - Rural wireless Internet services with Value Added Services capabilities such as commercial hotspot, security, cache and Video On Demand.
- Indoor 19" rack-mountable.
- WaveSwitch™ hub-spoke multi-waveform support:
  - Automatic on-the-fly MF-TDMA / SCPC Return Link switching, based on application, traffic density and scheduled triggers.
  - SCPC Return Link dynamic channel adaptation to meet traffic demand while conserving satellite bandwidth.
  - Real-time waveform switching provides real savings for applications seeing drastic traffic density changes such as cellular backhaul and trunk.
- Layer-2 and Layer-3 WAN transport support.
- Built-in PEP (Performance Enhancing Proxy) enhancing user experience and conserving satellite bandwidth usage, optimizing the link in both in both point-to-point SCPC deployments and in hub-spoke mode.
- Encrypted VPN tunnel support, allowing traffic protection from VSAT modem to the hub or to enterprise own router (ordering option).
- OpenAMIP antenna interface support for SATCOM on the Move (SOTM) applications.

## Typical Applications and Uses

- Mass-population Internet access.
- Smart enterprise connectivity.
- Remote / rural cellular services.
- Cellular backhaul links with terrestrial / satellite offload.
- Dynamic-throughput high-capacity links such as 4G and 5G RAN.

## Industrial IoT

Providing industrial IoT edge computing for smart mission critical applications such as:

- Energy, oil and gas
- Homeland security and smart city crowd protection
- Natural disaster prevention and management

The U9000 computing platforms allows running customized / tailor made IoT aggregation and processing applications including latest cloud-edge AWS™ Greengrass cloudlets.

## Operator-Tailored Value Added Services

- Running any OpenStack application on board, CoreOS Container Linux or similar
- Operator-provided value-added services such as VOD (Video on Demand) or monetizing localized services

## Open-RAN MEC Applications

Running open-RAN MEC platform (Multi-access Edge Computing / Mobile Edge Computing) applications – allowing MNO to offload processing from core to the network edge and drive content nearer to end users while maintaining full core compatibility and support including authentication authorization and accounting. MEC allows MNOs to provide their users with superior quality of experience. Several MEC use cases are extremely suitable:

- Deployment of MEC CDN (Content Delivery Network) end point to highly enhance quality of experience while drastically reduce backhaul load of sites deployed using satellite backhaul. Satellites are extremely economic allowing broadcast capability to push and update multiple CDN end points at once
- Use throughput guidance and QoS to throttle content delivery speeds and maintain high quality of experience for interactive applications at sites deployed with satellite backhaul
- Use MEC local breakout capabilities to setup sites with multiple backhaul links, terrestrial and satellite, for service resiliency and protect the infrastructures with MEC DDoS defenses
- Increase the capacity of LTE sites with complimentary satellite capacity. Use traffic steering / traffic offload to drive heavy content such as viral videos to the site through nearly unlimited satellite capacity while freeing terrestrial capacity for response time sensitive interactive applications

## Specification

Unit Characteristics	
Form Factor	Rack mountable
Installation	<ul style="list-style-type: none"> <li>▪ Indoor.</li> <li>▪ Matching variety of outdoor / RF options: C-band, X-band, Ku-band and Ka-band.</li> <li>▪ OpenAMIP antenna integration, GPS integration for on-the-pause / on-the-move applications.</li> </ul>
Open Edge-Computing Platform (see notes)	<ul style="list-style-type: none"> <li>▪ Open server computing platform.</li> <li>▪ Based on 4-core Intel Atom-family processor.</li> <li>▪ 16GB system memory.</li> <li>▪ 250GB SSD storage.</li> </ul>
Typical Applications	<ul style="list-style-type: none"> <li>▪ Cellular aggregation with MEC capabilities such as satellite offload for heavy content.</li> <li>▪ Broadband aggregation points with local content distribution endpoints.</li> <li>▪ Location-based value added services.</li> <li>▪ Industrial IoT / SCADA with edge computing capabilities for metering and alerting, surveillance and defense.</li> </ul>
Forward Link / RX	
Technology	DVB TDM Forward Link.
Channel Rate	Up to 500MHz.
Waveform	DVB-S2X ACM, GSE encapsulation, QPSK up to 256APSK LDPC/BCH.
Channel Spacing	5%, 10%, 20%, 25% or 35% channel spacing (roll-off factor).
Terminal IFL Input	F-type 75 ohm, 950 – 2150MHz satellite / band independent.
Return Link / TX	
Technology	<ul style="list-style-type: none"> <li>▪ 3D BoD™ Return Link multi-waveform technology:               <ul style="list-style-type: none"> <li>▪ MF-TDMA CF-DAMA (Combined Free and Demand Assigned Multiple Access).</li> <li>▪ Point-to-point and hub-spoke DVB-S2 SCPC.</li> </ul> </li> <li>▪ WaveSwitch™ on-the-fly and automatic waveform switching.</li> <li>▪ Terminal built-in Uplink Power Control (ULPC) and network-wide PowerACM™ link variability mitigation providing support for Ka, Ku and C-band.</li> </ul>

MF-TDMA Channel Rate	64Ksps up to 8192Ksps.
MF-TDMA Waveform	BPSK, QPSK, 8PSK, 16QAM.
MF-TDMA Channel Spacing	10%, 15%, 20% or 25% channel spacing (roll-off factor).
SCPC Channel Rate	500Ksps up to 25Msps.
SCPC Waveform	DVB-S2 QPSK up to 25APSK LDPC/BCH.
SCPC Channel Spacing	5%, 10%, 20%, 25% or 35% channel spacing (roll-off factor).
Terminal IFL Output	F-type 75 ohm, 950 – 2150MHz satellite / band independent.

### IP Services, PEP and QoS

Interfaces	<ul style="list-style-type: none"> <li>10/100/1000 Mbps Eth RJ-45.</li> <li>1x out-of-band satellite modem management.</li> </ul>
Download Speed	Up to 100Mbps.
Upload Speed	Up to 100Mbps.
Connectivity	<ul style="list-style-type: none"> <li>Wireline transparent Layer-2 connectivity.</li> <li>VLAN and VRF (Virtual Routing and Forwarding) support.</li> <li>Layer-3 NAT and DHCP server / DHCP relay. RIP routing protocol. VRRP support.</li> <li>Full multicast support from hub or from behind remote.</li> </ul>
Application Optimization	<ul style="list-style-type: none"> <li>Satellite WAN traffic TCP/IP and HTTP acceleration.</li> <li>Traffic aggregation and processing via software modules possible on the computing platform.</li> </ul>
QoS	Built in embedded satellite / WAN QoS support integrated with Forward and Return Link ACM.
Multimedia Support	<ul style="list-style-type: none"> <li>VoIP, video-over-IP / video-conferencing Virtual Telephony™ support.</li> <li>Multimedia QoS support, bandwidth assurance for clear VoIP QoE.</li> </ul>
Security	IPSec VPN tunnel strong encryption (availability limited by export control regulations).

### Environmental and Mechanical

Dimensions	435 x 45 (1RU) x 315mm (W x H x D)
Weight	3.8Kg
Power	<ul style="list-style-type: none"> <li>60W (not including BUC power), universal 100-240V AC 50/60Hz power supply; -48V DC power supply option available.</li> <li>24V DC provided to BUC.</li> <li>55W available for installation and RF equipment.</li> </ul>
Operating Temperature	0 – 50°C, 5% to 90% humidity non-condensing.
Certification	CE, FCC, CSA.

### Available Configurations

U9000 – open edge-computing satellite modem.

U9000-E – open edge-computing satellite modem with VPN encryption option included.

NOTE: Other mini-ITX computing platforms are possible with Minimum Order Quantity (MOQ)