



Advantech  
Wireless



## Advanced SATCOM Solution for Tactical Environments

Mobility for SATCOM users in a Military or Government Agency application context has always been a hot topic.

The ability to maintain a satellite link while on the move, or to quickly deploy teams in the field that can easily and reliably establish communication anywhere in the world have imposed many challenges on designers and system architects.

The unique mission critical requirements imposed by tactical environments adds a new class of users and potential applications to the traditional Fixed VSAT (Very Small Aperture Terminal) SATCOM market, and solidifies the unique position of Satellite based communication in the overall global Military Communication offering.

It is important at this stage to identify and define the different classes of Mobile Users.

1. By far the most attractive application and the most challenging would be the one identified as 'SATCOM on the move' (SOTM).

By deploying this technology, the users will be able to close a satellite link while moving either with a ground vehicle, aircraft or on a maritime or littoral platform. SOTM requires trade-offs in SWaP (Size Weight and Power) as well as performance/efficiency. SOTM solutions should only be used when an alternative fast deployment solution would not meet mission essential requirements.

2. A second group of users would be those who require fast deployment, and do not have the option of traveling with a vehicle.

These would be users that would hand carry ruggedized portable satellite terminals, man-packs, or even flyaways, with extremely fast deployment time, with the ability to log almost instantaneously into a satellite network.

Typically these terminals are much smaller than standard VSAT terminals, and must be able to efficiently use limited bandwidth and power resources.

3. A third group of Tactical users would include those that need rapid deployment from a vehicular mounted solution.

These would typically involve establishing a much higher bandwidth link than is practical through an SOTM system, and would make this bandwidth available to nearby tactical users in a Point-of-Presence (PoP) architecture.

## The designer challenges are multiple;

- Mobile users will need to switch or "roam" between satellites, gateways or beams. This requires sophisticated algorithms at the gateway and at each remote to be able to locate and acquire a signal from any one of several available satellites.

- Bandwidth management has to be done in a very intelligent way, in order to avoid cost overruns.

In the last 10 years, military conflicts in Iraq and Afghanistan have identified Satellite Bandwidth as a major cost factor.

Without proper planning, bandwidth costs can easily grow exponentially, or worse, bandwidth shortage can occur endangering the entire communication network. Very small SOTM terminals often require bandwidth "spreading" to avoid interfering with other users. Efficient allocation of bandwidth among these rapidly changing groups of users is mission critical requirement.

- Trying to estimate today the bandwidth needs of future users is close to impossible, and has proved to be damaging from both technical and financial points of view.

Many networks have been deployed as SCPC dedicated high capacity links, to be used only a fraction of the time, in a very inefficient and costly way. Other networks have been estimated as pure TDMA networks, burst mode with low traffic, to be later declared unusable as soon as the traffic requirement increases.

With this in mind, today's users are demanding flexible network architectures where the same terminal can be used as a pure SCPC terminal for high QoS and high data rate applications, or as a high bandwidth efficiency TDMA terminal for lower data rates applications.

This will guarantee by design the most efficient way of using bandwidth, and will release the system planners from the burden of deciding on which technology to select.

The complexity of the network operation must be transparent to the tactical user. The ASAT-II™ (Adaptive Satellite Access Technology) system brings efficiency to the network operator as a mission enhancing capability, while continuing to deliver all of the mission critical performance features to the tactical end user.

- Size and efficiency is important, if not critical. SOTM terminals, man-packs and flyaway terminals have to be lightweight, small in size, and have low energy consumption. This is a non-negotiable mission critical requirement. Advantech Wireless man-pack and flyaway terminals excel in weight and ruggedness.

- Network agnostic. Mobile users should be able to log into multiple satellites, multiple gateways, and switch them as required. They need to share the gateway and all resources with fixed users, and have interoperability capabilities.

Open standards like DVB-RCS and DVB-S2 as the preferred standards, while proprietary networks and implementations are at evident disadvantage.

## Advantech Wireless offers multiple solutions for the challenges of the Tactical communications environment.



## A. The Compact Transportable Next Generation RAPTOR Hub



The network architecture is based around the RAPTOR hub, with ASAT II™ capabilities.

Advantech Wireless ASAT II™ System and its' unique 3D BoD™ and WaveSwitch™ technologies delivers best possible service, highest quality and most efficient bandwidth utilization.

The RAPTOR Hub is a ruggedized, military grade, advanced multiple access wave form Hub, currently operating under the WGS constellation of satellites.

It incorporates key technologies that allow this Hub to be at the heart of a typical SOTM network.

RCSX™ Return Link technology encompassing improved efficiency: DVB-RCS / RCS2 MF-TDMA, ASCPC™ near-SCPC MF-TDMA and true SCPC – all in a single shared dynamic bandwidth pool.

Each remote can switch from any access mode to any other access mode, without user intervention, just by analyzing traffic profile and data requirements.

Each remote can become a very high data rate SCPC terminal, and switch to different classes of burst mode access, when traffic profile is changing.

This allows maximum bandwidth efficiency, and standardization among all network users, without the risk of wrongly assumed initial traffic profile.

It has been demonstrated that this approach can easily reduce the bandwidth cost by 50% while maintaining mission critical levels of bandwidth and performance.

- The RAPTOR Hub incorporates highly advanced Beam, Gateway and Satellite Handover techniques, either based on location, or on link performance.
- The Hub updates its user profiles every 26 msec, this is the fastest in the industry, and extremely important when the same user can change completely its access profile, or it has to do network beam or gateway/satellite handover.
- The Hub is always hardware ready to its maximum capacity. No hardware cards or hardware upgrades have to be installed in the field, when users are added. No extra hardware inventory, prepaid, has to be kept in stock.

More carriers can be added instantaneously. Everything is upgraded via software keys, which is a major improvement over all existing hubs in the field.

The necessity to dispatch teams in the field to upgrade hubs with hardware, in a tactical environment, with long delays and incertitude, is eliminated.

## B. The Remote Terminal



At the remote site, the main modem technology is included in the Advantech Wireless MU7400 series.

This ruggedized modem line incorporates the ASAT II™ technology, and the Beam, Gateway, Satellite Handover intelligence, all in a DVB-RCS/DVB-S2 compliant platform.

This modem is designed for outdoor use with a -40oC to +65oC temperature range in a fully enclosed (no fans) unit.

## C. The GaN SSPA section.

Starting in 2010, Advantech Wireless has launched a new line of extremely powerful GaN (Gallium Nitride) based SSPAs.

These units exceed in RF power, linearity, and efficiency beyond any existing technology, either solid state, or TWT based. The GaN technology allows us a dual approach:

- We can build now extremely powerful SSPAs for the gateways, to work in full integration with the Raptor Hub. Systems with over 6 kW power levels in X-band were delivered and are today in operation worldwide.

This huge amount of power enables the very large amount of data traffic that Military SATCOM networks require today.

These systems can be mounted indoor or outdoor, with full built in redundancy. In this context, a powerful teleport can be built in transportable trailer, enabling mobility even at large command centers level.

- We can build now extremely small power amplifiers, which are the key for SOTM, man-pack SATCOM, and flyAway.

Using GaN, a new generation of SOTM terminals was released, designed to work in extremely harsh environment, as defined by MIL STD 810F.

These units can handle a wide operating temperature range and high levels of shock and vibration, while still performing with very high linearity and efficiency. These units are currently operating in the WGS environment.

Below is a list of several GaN based SSPAs, specifically designed for mobile applications, including SOTM:

- 25W X-Band GaN, miniature unit, WGS certified
- 50W X-Band GaN, miniature unit, Second Generation, higher linearity and higher efficiency
- 400W X-Band GaN, Second Generation, for mobile trailers, SOTM for Navy
- 6KW X-Band GaN, Second Generation, powerful unit for mobile Teleports
- 50W Ku-Band, 50W X-Band, 20W Ka-Band, GaN based, for SOTM on military vehicles, WGS certified
- 100W Ku-band GaN, Airborne Grade, DO106G compliant for SOTM on aircrafts
- 200/250W Ku-Band GaN, Second Generation, for military mobile trailers
- 300W C-Band GaN, Second Generation, SOTM for Navy



X-Band 25W SSPA/SSPB Second Generation GaN Technology



X-Band 300W/400W SSPA/SSPB SapphireBlu™ Second Generation GaN Technology



100W Ku-Band AIRBORNE Grade SSPB Advanced GaN Technology



X-Band 6,600W Rackmount Modular SapphireBlu™ Series Second Generation GaN based SSPA/SSPB



20W Ka-Band Hub-Mount SSPB/BUC

## D. Mobile terminals

Advantech Wireless RF and VSAT products work on the full range of tactical environments.

While our systems will work with any compliant SOTM antenna platforms we also are able to provide complete terminal solutions for man-pack, flyaway and vehicular mounted quick deploy systems.



Specific Advantech Wireless tactical terminals include the 65cm man-pack solution, which includes an X-Band, Ku-Band, or Ka-Band antenna reflector and feed, the corresponding GaN BUCs, and the A-SAT-II™ triple access mode modem. Integrated together, this is an ideal solution for intervention teams which do not have the option of traveling by a vehicle.

The 65cm terminal is fully independent, with battery and battery chargers, including solar panels.

The Advantech Wireless 1.2m X-Band, Ku-Band, or Ka-Band Engage™ class flyaway terminals, allow much higher data rates, and are ideal for remote tactical operations centers and command centers.

Equipped with the same GaN based RF line of BUCs, ASAT II™ modems, and antenna controller, the terminal includes IP routers, a complete set of test equipment, and location finding equipment, battery and chargers, all in ruggedized military grade transportable cases.



For vehicular platforms needing a robust quick deploy SATCOM system with high throughput and redundancy Advantech Wireless can offer the Pioneer series of vehicular antennas coupled with our ASAT II™ network.

These systems make an ideal high speed PoP or network extension in a tactical environment.



A typical tactical network architecture will in this case be based on one or several RAPTOR hubs, deploying several true SOTM terminals either on vehicle, aircraft, or navy, combined with mobility at soldier level via man-packs, and at local command level via flyaways, vehicular, or fixed terminals.

The major advantage would be in standardization of all of the above terminals, and the ability to manage bandwidth resources in a truly efficient way, by switching access techniques without any user intervention in the field, covering multiple hubs, and multiple satellites.

Advantech Wireless offers a complete range of in-house and customer integrated solutions for tactical environments.

Our ASAT II™ systems provide a scalable, efficient field deployable network fully integrated with state of the art remote terminals and RF systems.

We have a long history of providing extremely reliable and secure systems to Government, civil, and military users.

Please contact your local Advantech Wireless Sales office for a more detailed discussion of these products and their applications to your mission requirements.



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At Advantech Wireless we provide industry-leading innovations in advanced end-to-end satellite communication technologies. Our commitment is to help our customers achieve best performance and maximize ROI by providing complete customized turnkey solutions. We design, manufacture and deploy networking solutions for broadband connectivity, broadcast solutions and backhaul requirements using satellite and terrestrial wireless communications.