

# Wearable Computing at the Tactical Edge

**M**ore than just a conventional power & data hub, Ultra's software defined UltraLYNX product provides the warfighter with a truly wearable computer at the tactical edge. This article describes several use cases where UltraLYNX can be utilised to provide immediate benefit to the soldier who wears it, and in its wider role in contributing to a Common Operating Picture across the battlespace.

As our war fighters at the front will testify, the mission for them is very much about life and death. Charged with getting to the objective, whether it is for reconnaissance or something more sinister, the soldier must use every sense, including that infamous sixth sense, to provide themselves with a personal "situational awareness".

Right at the heat of the moment, there may be a call on the radio for a 'sit rep'; the timing could not be more inconvenient! Originally created for Medical Evacuation, the '9 liner' sit rep has become a common way of providing 9 lines of essential information including heading, distance and descriptions of the target. The soldier fills in a simple table then calls them in over the radio as lines 1 to 9.

So, what if the immediate situational awareness that a soldier sees, hears, and somehow feels, could be automatically created and relayed to others? The 9 liner would be automatically populated where possible, with

minimal input from the already busy warfighter. What if, in addition to their location, additional information such as battery state, ammunition level, the amount of water a soldier had available and even their health status was included in an automatic sit-rep. All of these things are relatively straightforward to achieve with commercially available devices. An additional sensor or two here, a wearable bio-sensor patch there, a bit more cable and voila; a fully "digitised" soldier. However, what about all that data that is now created. No longer fitted neatly into 9 lines, no longer just about the objective, this data will at the very least need to be managed, processed and filtered. Now receiving multiple detailed sit-reps in near real time, the troops on the ground all the way up to HQ have the tools to create a truly Common Operating Picture (COP).

Key to creating the COP will be the adoption of Artificial Intelligence and Machine Learning (AI/ML), to help filter, sort, and ultimately understand the battlefield as it evolves. Ultra has an AI/ML centre of excellence based in Canada and deploys its resources as required to each Business Unit on a case-by-case basis. Called ReMI (Resilient Machine Learning Institute) our centre is a transformational institute founded in Montreal, focused on developing Artificial Intelligence and Machine Learning technology. Founded by L'École de technologie supérieure (ÉTS) and Ultra in 2019, ReMI





provides a rich team of international PhD, PostDoc, MSc and graduate level students, professors and Ultra engineers. The institute is a unique organization that is using applied science to tackle real-world problems by leveraging state-of-the-art programming techniques in the fields of AI and ML.

UltraLYNX is specifically designed to interface all of the soldier worn peripherals. As well as the conventional soldier fit (Radio, GPS, EUD, Battery) we have integrated a huge range other 'useful' devices including cameras, GPS denied tracking, physiological monitoring, gunshot detection, blast detection and even environmental sensors that can all contribute to understanding the context of the wearer sit-rep.

The UltraLYNX SWaP optimised processor along with its containerised software architecture supports the AI/ML algorithms required to create the situational information both locally and for the COP, without burdening other devices such as the soldiers End User Device (smartphone/tablet/AR goggles) or having to carry another mission processor box and cables.

On the subject of End User Devices, being able to feed digital data into an existing analogue eyepiece may sound trivial, and perhaps even a waste of time, given the huge push on AR goggles such as the IVAS programme in the USA. However, there are several in-service helmet mounted displays (HMD) that can be easily interfaced to UltraLYNX to provide a simplified capability for Situational Awareness, without all the complexity of a full set of AR goggles. Again, the built in application processor gives UltraLYNX the means to render an image (from the 9 liner data) into a format that can be sent directly to the HMD. This gives the user a Sit-Rep without having to look down at the conventionally chest mounted EUD. A simple USB input device (plugged into an UltraLYNX port) provides control of the display and menu selection.

As mentioned in previous articles, UltraLYNX can be configured as a tactical router, managing information

exchange between different radio nets both locally and across the command echelons. Coupled with this is the emerging need for encryption and cross domain interconnectivity. UltraLYNX has several strategies for this, including inline modules and System On Chip solutions that meet the required home nation accreditations.

Another capability that may be of use in the digital age is Signal Intelligence. All electronic devices emit RF energy, so the ability to detect an adversary who may be using less stringent commercial grade equipment could be a useful advantage. In the past decade, there has been huge advances in the field of Software Defined Radios. UltraLynx can be used to hold the necessary configurations of such SDR's allowing the user to change the function at will. One aspect we have been exploring is a SDR based Spectrum Analyser that would give the soldier the means to sweep the local area for potential RF hotspots and waveforms. UltraLynx already has space for a small daughter board, which with a remote RF head/antenna assembly could provide a cost effective SIG-INT device that could contribute to the overall situational awareness picture. This approach is similar to the US SOSA initiative for vehicles and airframes, where chassis mounted SDR cards are deployed in a common form factor, with a remote RF head fitted to the platform.

As this article sets out, UltraLYNX is a tangible solution for providing wearable computing at the tactical edge. Whilst not providing hundreds of teraflops of computing power, the use cases described here demonstrate an increased capability for the warfighter, in a compact form factor that is already necessary to provide the current power and data hub function. ■

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