

## WHAT'S INSIDE

1. Introduction
2. Collaboration in the Defence Sector
3. Enhanced TDMA Realism
4. Benefits
5. Conclusion

## TDMA MODELLING CAPABILITY ENHANCES TACTICAL DATA LINK SIMULATION AND TESTING

Link 16 is a standardized communications system used by US, NATO, and Coalition forces for transmitting and exchanging real time tactical data using links between allied military network participants, also known as TADIL J (Tactical Digital Information Links – J series) by the US Joint Services. With Link 16, military aircraft as well as ships and ground forces may exchange their tactical picture in near-real time. Link 16 also supports the exchange of text messages, imagery data and provides two channels of digital voice.



Link 16 uses Time Division Multiple Access (TDMA) to provide multiple, simultaneous communication paths through different nets. This is achieved through the division of each cellular channel into different time slots, enabling multiple users to share the same frequency at the same time. By allocating a discrete amount of bandwidth to each user in this way, TDMA organises the amount of data that can be carried over the channel, while enabling near simultaneous conversations.

The challenge until now has been the ability to realistically, yet easily, replicate the TDMA protocol in a simulated testing environment. With the introduction of the TDMA Mesh feature, the Calnex NE-ONE Network Emulator addresses this challenge.

### COLLABORATION IN THE DEFENCE SECTOR

Defence sector-focused product and services companies Antillion and Calnex Solutions have worked together on several projects that have been facilitated through the SERAPIS Framework Agreement which enables the UK's Dstl (Defence Science and Technology Laboratory) to deliver new and battle winning capabilities within C5ISR (Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance), Space Systems, Synthetic Environment and Simulation technologies.

One such collaboration has been simulations of Denied, Degraded, Intermittent and Limited (DDIL) network environments within the Open C5ISR Test and Evaluation (OCTANE) 1 environment. Using the Calnex NE-ONE network emulator to recreate these DDIL network environments, UK armed forces can understand the processes, network policy decisions, and new protocols and services that are critical to gaining a strategic advantage in combat situations. Understanding the impacts of DDIL and developing methods and tools to mitigate the potentially adverse effects of such network conditions, helps to improve end-user experiences.

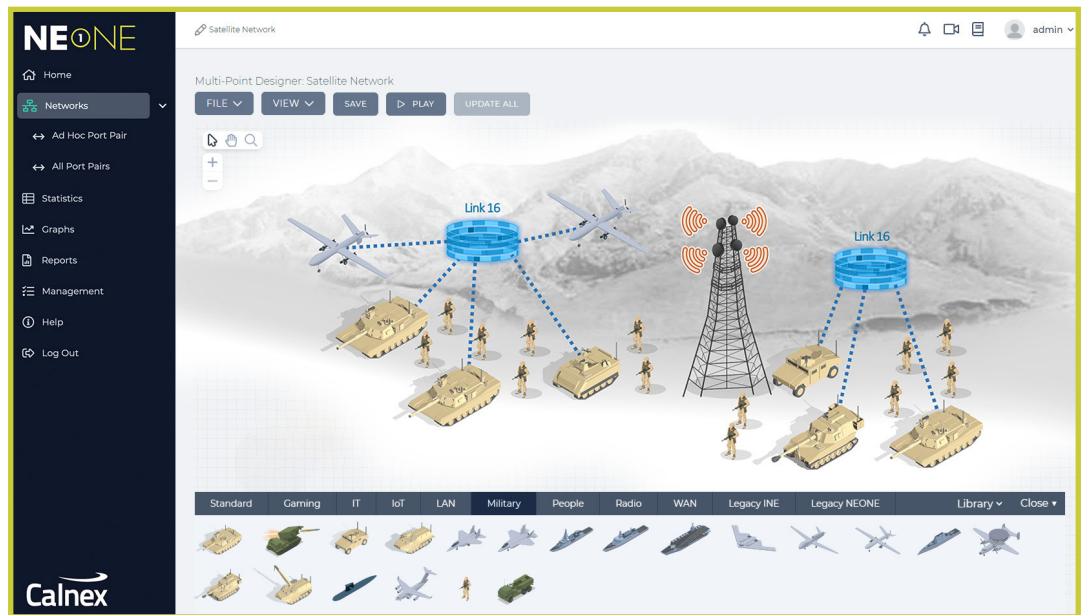
### ENHANCED TDMA REALISM

With TDMA being central to Link 16's ability to deliver mission-critical intelligence across multiple domains, there is a need to ensure any pre-deployment applications or systems testing, or the training of personnel in the use Link 16-based tactical data links, includes this important component of the delivery mechanism.

## ENHANCED TDMA REALISM (CONT.)

With this objective in mind, Calnex has produced a TDMA Mesh feature within the NE-ONE Enterprise that emulates many different MOD bearers of opportunity, allowing for enhanced testing fidelity and the simulation of complex and dynamic networks.

The NE-ONE TDMA Mesh feature is a software defined implementation of TDMA which lets the developer/tester define the total number of transmission 'slots' and the slot length (milliseconds). In addition, transmission speeds (bps) and queue sizes (bytes) can be specified to properly emulate queuing within "device's" radios. For each 'device' (either real or simulated) which is connected to the NE-ONE the developer/tester specifies which slots the device can use. It is also possible to leave slots unassigned allowing a small number of test 'devices' to appear to be in a large TDMA mesh with the correct fidelity.



*NE-ONE Enterprise TDMA Mesh Link 16 Emulation*

Using TDMA mesh in this way creates the patterns of transmission, latency, jitter and loss associated with TDMA Mesh networks allowing testing/training to take place without the need for a radio environment. While the focus of this case study is on Link 16, this capability is equally applicable to the simulation of Link 11 and Link 22 Tactical Data Links.

## BENEFITS

Using the NE-ONE's ability to script and control the test environment allows the rapid creation of repeatable test network environments to try different network policies to handle the data, so that thousands of iterations can be used together with empirical data to help design real networks. Incorporating this TDMA Mesh feature into the OCTANE test bed has enabled realistic pre-deployment trials of ship-based communications systems to be carried out at considerably lower costs, both key drivers for the development of the OCTANE platform, than would have been achievable in the past, as well as bring a greater level of TDMA fidelity/realism to any research tasks.

## CONCLUSION

The NE-ONE is fully integrated into the OCTANE environment for further testing within future process network protocols and end systems. While the emphasis of the current project has been focused on the maritime domain, going forward, it is envisaged that this capability will be deployed to test systems in the UK air and land domains and the wider NATO multi-domain environment.

### Footnote

<sup>1</sup> OCTANE is The Open C5ISR Test And Evaluation Environment. This CIS environment is focused on supporting Defence research and development, to accelerate research tasks into the experimental phases, whilst also reducing costs for the research tasks. OCTANE does this by leveraging the security principles of the Antillion Hosting Environment to reduce the accreditation effort (both time and cost) for many tasks. OCTANE also reduces task costs by managing software licences across multiple tasks, providing a licencing service model where the user only pays for what they use when using it.

OCTANE allows Defence, industry and academia to work together in a shared sandbox environment, with rules in place to safeguard the data allowing the ad-hoc project team to collaborate. OCTANE can also be used by teams as an integration staging area, allowing task members to come together to integrate their products before deploying to live experimental sites. OCTANE supports migrating task services, moving to other environments for re-world experimentation, and bringing these back into OCTANE.

For more information on OCTANE contact [octane@antillion.com](mailto:octane@antillion.com)

