



etherstack

# WAVEFORMS

## For Portability and Performance

Across military, civilian, avionic and transportation communications: Etherstack specialises in the specification and development of wireless protocol stack software for professional radios used in demanding environments.

- Custom and standards-based development
- ANSI C Reference Waveform
- SCA compliant (Optional)
- Automated Etherstack Lightweight Integrated Test Environment (ELITE)
- Code reuse specialists
- Configuration management
- Support from requirements analysis through to fielded radio systems
- Regional development centres for local support
- Full technology transfer



## Managing Modern Radio Communications

The adoption of wireless digital voice and data has increased both the complexity of radio communications and the expectations of users.

Etherstack helps manufacturers and defence organisations navigate this. We take responsibility for underlying radio software development, allowing our clients to concentrate on issues relevant to end users: requirements, architecture, form-factor, packaging, delivery and support.

Over the past fourteen years Etherstack waveforms have been successfully deployed on a wide number of fielded civilian and military radios around the world.

## Waveform Development is Affordable

Etherstack offers a highly competitive fixed price for full waveform source code and all services and documentation. This includes complete specification, design, interface and test documentation; PC-based radio configuration tools; our pioneering automated test system and a comprehensive suite of test scripts developed to your requirements.

All waveforms can be supplied in either normal or SCA format, or both. We also emphasise ongoing support to ensure your radios are fielded successfully and your waveform software is kept up-to-date with new features.

We consider ourselves an extension of your engineering team. You have full visibility of our engineering products and processes.

## Software Communications Architecture (SCA)

You can select which radio platform you use your waveform on.

A well designed waveform should allow you complete freedom in the choice of radio you build. All of our waveforms are suitable for both normal and SCA radios. This means you can use the same waveform – with the same features - on SCA platforms (in SCA format) and on normal radios (in native format).

Etherstack's SCA team has been working on SCA related projects for five years and our waveforms are now used on fielded SCA radios.

## Software Reuse

### Reduce Costs and Speed Time-to-Market

- ➔ Waveform software represents a key investment. It is important you can reuse it on future platforms and in derivative products to save money, reduce risk, speed time-to-market and respond quickly to changing markets. Reuse also allows you to make use of new and more capable processors as they inevitably become available.

### Software Reuse: Design

- ➔ Code reuse is our priority. We specialise in highly modular operating-system agnostic software that can be ported to a wide range of embedded platforms without compromising performance.

### Software Reuse: Maintenance

- ➔ Successfully maintaining software used in fielded radio systems is complex. The details are important: it is our job to pay close attention to documentation, test script generation, source control and code updates as standards and features evolve.

### Software Reuse: Testing

- ➔ Etherstack has developed ELITE - a pioneering automated test system - to ensure successful code development, delivery and maintenance. ELITE allows automated testing of the waveform (or a single waveform module or group of modules) in the development environment, after integration, during field trials and as new features are introduced over time.

- ➔ Comprehensive TCL test script suites are provided with each waveform to allow rapid regression testing and expansion of test capability as new features are added.

### Software Reuse: SCA

- ➔ ELITE includes SCA support, allowing complete testing of SCA waveforms across their SCA ports.

1



Every Etherstack waveform starts with the Etherstack and Etherstack Core Services (ECS).

2



ECS

The air interface protocol stack layers, sub-modules and waveform is complete. ECS provides platform abstraction.

3



ELITE

The waveform layers, sub-modules and interfaces are tested using ELITE.

4



ELITE

ELITE runs on a PC and tests the waveform both in the development environment and on radio hardware.

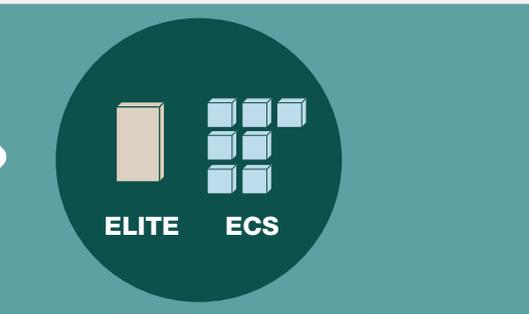


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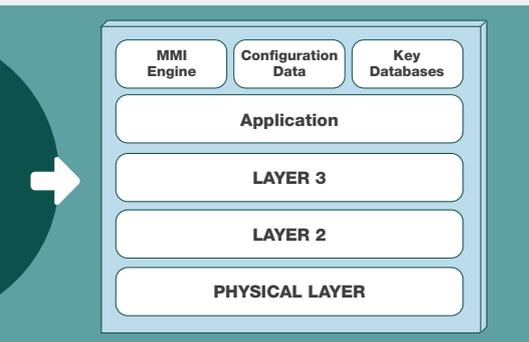
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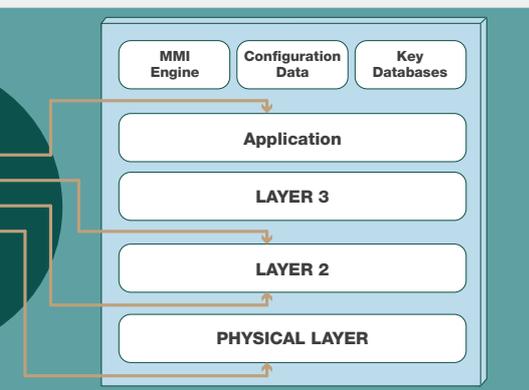
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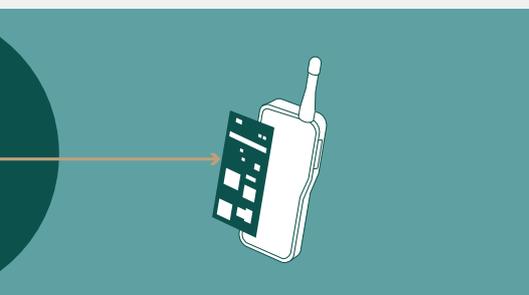
Etherstack Lightweight Integrated Test Environment (ELITE)



Waveform modules and interfaces are then built using ECS until the waveform is ready for integration so that any operating system can be used.



Waveform modules are tested during development and integration



Waveform is tested in simulation and once it has been integrated to

## A Typical Waveform Project

### Contract

A contract is signed and the deliverables agreed.

### Requirements Specification

Gathering the requirements and documenting them formally to define the product we are contracted to deliver.

If an existing air interface standard or reference is used this will often contain inconsistencies or even errors that need to be corrected. A customer may also want to add proprietary features. Experience across a variety of different protocols is invaluable at this stage.

### Design

Etherstack aims to maximise Portability, Maintenance and Performance (PMP) during design and implementation.

A misconception exists that a waveform is composed of algorithms and that waveform design is therefore a mathematical problem. In fact, as represented by the OSI Reference Model, a waveform is a set of heterogeneous layers with only the lowest of these directly involved in signal processing. Truly portable embedded software also includes control, configuration, test and hardware abstraction elements. Waveform design is therefore a complex combination of embedded system software design, air interface expertise and mathematics.

We first represent the waveform design as a series of layers based on the OSI Reference Model. We then continue to divide the design down until every sub-function in the waveform is represented as its own module with a well defined and testable interface.

### Implementation and Level 1 Testing

Each waveform module is then implemented in ANSI C using Etherstack Core Services (ECS) to create a Base Waveform. The Base Waveform forms the reference that is maintained and integrated to each new radio platform.

Level 1 (Unit) Testing is carried out during implementation using the automated Etherstack Lightweight Integrated Test Environment (ELITE).

Our DSP R&D division is responsible for implementing the lower layers of the waveform whilst the higher layers are implemented by protocol stack specialists with the relevant experience in either PMR, cellular or military communications.

### Level 2 Testing in Simulation

During implementation test scripts are developed to prove every requirement in the original specifications. Once the Base Waveform is complete, Level 2 (Base Waveform) Testing is executed against it in simulation on a PC using ELITE.

### SCA Porting

If the waveform is going to be used on an SCA platform an SCA version is created at this stage using Etherstack SCA Wrappers.

Etherstack's ELITE then applies the Level 2 tests to the waveform across its SCA ports.

### Integration

The waveform is ported to the radio platform using processor specific optimisation as necessary, in the process creating a Target Waveform.

The Design and Implementation stages are geared towards making the Integration stage as easy as possible.

There are three steps:

1. Determine the best way to distribute the waveform modules over the processors available on the platform.
2. Align the platform to waveform interfaces: Audio, Transceiver, Application, Database etc...
3. Integrate the waveform to the platform, performing optimisation as necessary.

### Level 2 Testing on the Radio

Level 2 (Target Waveform) Testing uses ELITE to execute the waveform test scripts against the integrated code on the radio platform.

### Waveform Maintenance and Configuration Management

The purpose of implementing a radio in software is to be able to use that software – the waveform – for years to come.

Maintenance and configuration management are critical as new features are added over time and the waveform is used on different platforms.

We provide you with full documentation, test tools, tests and source code to enable you to maintain your own waveform going forward. We also provide long term support and upgrade contracts if you prefer us to maintain it.

