Increasing the Value of Testing

Improve Interoperability with Reduced Costs

If only Tactical Data Link (TDL) Systems were as wonderful as mobile phones

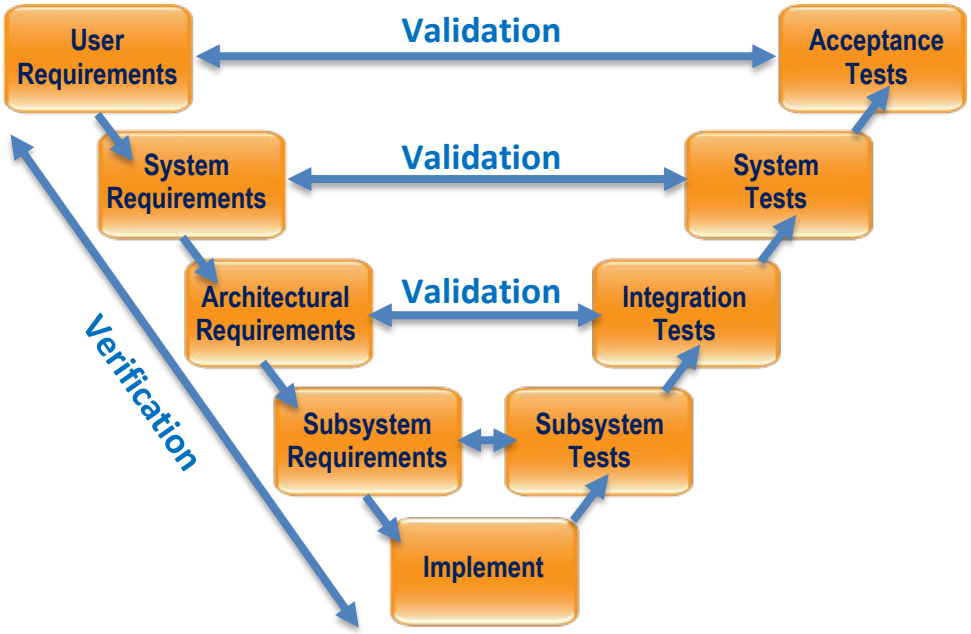
It's no secret that the mobile phone industry has seen huge growth and development in a relatively short timeframe. With advanced features paving the way forward in both domestic and commercial environments, we have seen mobile phones go from a luxury to an everyday item.

Part of the mobile phone industry's success is due to the fact that it follows established systems engineering principles. So, let's take a closer look at it, specifically, from a software and hardware interface perspective, why is it so good?

- Even the most primitive devices support real-time exchange of voice across the world
- Real-time exchange of data
- Multi-functional capability in terms of navigation, environmental sensors and body sensors
- They are adaptable and reliable
- Relatively low cost
- And the big one here for our industry … they are interoperable.

So, what is it about the mobile phone industry that enables it to be so successful? Most importantly, the 3rd Generation Partnership Project (3GPP) which is a collaboration between groups of telecommunications associations globally, whose initial development of standards for the 3rd generation mobile phone systems, but now includes development and maintenance of 2G and 4G standards. 3GPP follows a 4-stage model which focuses on users, definition of the systems architecture and the implementation of the architecture by specifying protocols and the definition of tests.

What is clear is that the 3GPP approach follows established systems engineering principles as denoted by the 'V' diagram below.



TECHNICAL ARTICLE

Although there are distinct parallels between the mobile phone industry and the TDL industry, one area where the two industries diverge is in testing, in which the mobile phone industry is more rigorous.

- Design is tested at all stages of development
- Hardware and software are tested in parallel
- There is full testing of the complete phone system against requirements specification
- A comprehensive range of formal tests are applied and they are used as a basis for approval and market release. Deployment only occurs when approval is achieved.

The rigorous, formal tests include conformance testing, interoperability testing, scenario testing and audio checks to name a few. All of which must be repeatable, regardless of test organisation and equipment - this is achieved by using standard test cases, of which there are hundreds of pre-defined test cases prepared under the auspices of governing bodies.

Let's now further consider how the world of TDLs differs from the mobile phone industry. We have to ask, do defence acquisition processes encourage full engagement with the testing part of the life cycle? Moreover, are validation activities given the required priority in a System-of-Systems (SoS) context?

Although conventional defence systems acquisition processes often include regular progress and design reviews, there is often very little real engagement until 'Acceptance Tests' and even the acceptance tests and criteria are often prepared by the manufacturing organisation. Lack of engagement with validation/testing activities means that defects become too expensive to rectify. Usually, there is no single SoS engineering contractor to control the whole process, so the defence acquisition authorities must be responsible for all other stages of the 'V'.

There are methods and technologies to support the left side of the 'V' - these include Ministry of Defence Architecture Framework (MODAF), Department of Defense Architecture Framework (DODAF), etc. However, there are few methods and technologies for the right side of the SoS 'V' and this issue is not limited to defence acquisition.

Because acquisition authorities do not fully engage with the SoS validation/testing process, they do not become aware of defects until very late in the acquisition process, when they are too expensive to rectify. Consequently, they have to be overcome by expensive 'get well' programmes, Standard Operation Procedures (SOPs), or just 'lived with'.

In conclusion, in the TDL community we can reduce risk and increase affordability by learning from other successful sectors such as the mobile phone industry.

What can be done to reduce risk and increase affordability?

Rigorous development of specifications:

- Modelling to ensure complete, consistent, correct.

Development of standard test cases:

- Models can be used as a basis for test cases.

Make test cases open:

- Help manufacturers know what they need to do; this reduces risk;
- Development test evidence contributes to SoS-test; this increases affordability.

John S Hartas

Managing Director

About SyntheSys

SyntheSys provides defence systems, training, systems and software engineering and technical management services over a spectrum of different industry sectors. Along with distinct support and consultancy services, our innovative product range makes us first choice provider for both large and small organisations. Established in 1988, the company focus is on fusing technical expertise with intuitive software applications to solve common industry challenges.