

ABSTRACT

Aimed at mobile device protocol developers, this paper briefly describes the various solutions available to help you achieve your business goals. It describes the benefits enjoyed by the leading cellular protocol developers who adopt a purpose-built signaling test solution.

INTRODUCTION

Developers of mobile wireless chipsets and devices are facing increasingly difficult challenges to deliver quality, leading edge products on time and in budget. Today's smartphone will be yesterday's in 6-12 months so time-to-market is critical to secure sales, gain market share and command a premium price. Delayed product launches cannot be tolerated. Devices now encompass different cellular radio standards alongside short range technologies such as Wifi and Bluetooth. The interactions and interworking between these technologies have led to an explosion in technical complexity. The high level of demand for development and test engineers who are expert in the latest protocols and standards has resulted in a scarcity of skilled resource. All of these challenges are faced against the backdrop of uncertain market conditions leading to shrinking budgets which further increases pressure on stretched R&D teams.

Delayed product launches cannot be tolerated



Figure 1 - It is increasingly difficult to deliver on time and in budget

Starting with a definition of high level business goals, this paper examines the available solutions available to help you meet these challenges and describes the benefits of laboratory based signaling testers.

BUSINESS GOALS

Identify and Fix Problems Early

Fixing problems at the earliest opportunity will minimize your costs, risk and time to market. The financial benefits of fixing problems early have an order of magnitude that runs into millions of dollars. Finding and fixing a software problem after delivery is typically 100 times more expensive than finding and fixing it during the requirements and design phase*. Problems experienced by consumers in the field can be catastrophic for a brand. 6 of the top 10 most valuable global brands in 2013 are telecoms and technology companies with a combined brand value of \$612bn**. Reduction in consumer confidence that results from field issues will quickly decimate your brand equity. Identifying and fixing problems early is a business goal for any mobile product development organization.

Fixing problems early is a business goal for any wireless product development organization

Implement Correctly - First Time Round

Your products need to work in accordance with the latest industry standards to ensure a high quality user experience, interoperability with different networks and global roaming capability. Any deviation from the product or standards specifications will need to be fixed. Between 20-80% of your development effort can be spent on rework*. This extra engineering effort is frequently underestimated in the original plans and results in a launch delay, a reduction in functionality or a reduction in product quality. Faced with an immovable launch date, working towards a goal of correctly implementing protocols the first time round will reduce your costs and improve product quality.

Correctly implementing protocols the first time round will reduce cost and improve product quality

*The Center for Empirically-Based Software Engineering (CeBASE) eWorkshop, 2001.

** <http://www.marketingweek.co.uk/Journals/2013/05/20/x/b/m/BrandZ-Top-100-2013.pdf>

AVAILABLE SOLUTIONS

In order to meet your business goals, you must invest in a mixture of best practice project management with the latest engineering methods. You will hire world-class engineers and equip them with effective development tools and test solutions. There are several alternative solutions available for testing wireless protocol implementation. Every one of them is likely to be used to some extent throughout the process. Some may provide value at every stage while others are only suitable for a specific task or development phase. Each solution has its own advantages...and drawbacks.

Live Network

Perhaps the most obvious way to test a mobile device is under real-world usage conditions – connected to a live network. This approach has the advantage that the device will behave as it would in the hands of a real end user. You will recreate the actual end user experience. The main problem is that there are many variables outside your control. You cannot isolate issues by changing the Radio Frequency (RF) environment, nor can you easily modify network configurations. Indeed many of these factors will be non-deterministic and will be changing each time a test is run. Under a live network it is impossible to accurately reproduce the conditions under which a particular behavior was observed.

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Commercial Network

Live commercial networks only offer commercialized technologies so it is not possible to test leading edge capabilities. Commercial networks are not able to make measurements of key User Equipment (UE) performance indicators such as RF power and signal quality to the same accuracy as laboratory instruments. A significant part of your test plan will involve verifying correct device behavior under abnormal conditions and during failure scenarios. Forcing abnormal conditions and failure scenarios in a commercial network will disrupt the service to paying subscribers. Leading edge developers are in a race to be first to market with UE capabilities that are ready in advance of commercial network deployment. If you are developing leading edge products then commercial network testing is simply too late.

Forcing abnormal conditions and failure scenarios in a commercial network will disrupt the service to paying subscribers

Test Network

A live test network is an isolated network built using the same infrastructure hardware as a commercial deployment. This allows testing on a live network without affecting commercial services. Pre-commercialized network equipment can be used to test new technologies and it is possible to test abnormal conditions, but a very high level of investment is required to set up and maintain the equipment and staff to run a test network.

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Commercial Infrastructure Equipment

Commercial infrastructure equipment such as eNodeBs, can be installed into a laboratory and possibly combined with traditional laboratory instrumentation. This can seem like a low cost solution if you are part of an organization that also develops network infrastructure, as the equipment may be available at a low cost. The problem is that network equipment is not designed for laboratory use. It is designed to transmit at high power levels which need to be attenuated. This means that you cannot precisely control power levels and it is difficult to create accurate, repeatable tests. The equipment will also generate a lot of heat – making for an uncomfortable work environment! Combining many cells and radio technologies into a single test environment will require you to connect many large pieces of equipment and to control them in a coordinated way. This type of solution requires the development of bespoke test control software – and a large amount of lab space.

Network equipment is not designed for laboratory use

In-house Developed Tool

Another solution is to develop your own, bespoke in-house testing tool. A lot of the skills and knowledge available to UE developers are common to the creation of a signaling tester. Proven components of UE hardware and software may be available to you, and you may be able to repurpose those components to simulate the network side operation. The main problem with this approach is that it will divert much valuable resource away from your core business activities. Few organizations can justify the many engineering-months of effort on non-core activities to develop tools that are truly fit for purpose.

The main problem with an in-house developed tool is that it will divert much valuable resource away from core business activities

Commercial Signalling Tester

Commercially available signaling testers incorporate software tools for creating tests, running tests, and analyzing UE behavior. A properly designed signaling tester offers you different points of observation and control along with the ability to change any parameter of the simulated network. This means that you can isolate issues with the UE under test and observe behavior under a wide range of conditions – including exceptional conditions that are beyond ‘normal’ operation. The very best purpose-built signaling testers are offered by companies with a longstanding tradition in test and measurement with a deep understanding of the specific needs of UE developers. Significant benefits will be gained by adopting a purpose-built signaling tester as the heart of a successful UE development and testing strategy.

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THE BENEFITS OF A COMMERCIAL SIGNALLING TESTER

A commercial signaling tester will help you to meet your business goals of early fixes and correct implementation.



Figure 2 - A commercial signaling tester brings many benefits

Reliability

Signaling testers are developed and tested against a number of different reference devices and undergo extensive quality assurance to ensure that test results are consistent with the standards, and repeatable to give maximum confidence. High confidence in results will lead your team to thoroughly investigate the cause of all failures. This means that you will identify and fix more problems earlier, avoiding costly rework, delayed product launch, product recalls and damage to your brand’s reputation.

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Accuracy

False pass results will lead to problems down the line when issues inevitably resurface at a later stage. This means that issues become significantly more expensive to fix. Accuracy saves you time and money because it ensures confidence in the test result. The test will not need to be run multiple times and the number of false pass results will be low. Commercial signaling testers are designed with accuracies similar to other laboratory instruments such as general purpose signal analyzers and signal generators. This means that downlink power levels can be set accurately, and uplink power levels and UE performance can be accurately measured.

Commercial signaling testers are designed with accuracies similar to other laboratory instruments

Adaptability

A signaling tester offers you the ability to create your own custom test cases that are easily modified in order to create variants for extended test coverage, or conveniently parameterized so that you can run the same test sequence with a different network or UE configuration. You can force invalid or exceptional configurations to test UE behavior under abnormal conditions. With a signaling tester you can comprehensively test emergency calls in a simulated network environment without falsely alerting public safety organizations!

Create test cases that are easily modified to create variants for extended test coverage

Technology Lead

Commercial signaling testers enable you to test leading edge technology at the very earliest opportunity. Just as you are in a race to secure market share by delivering new product capabilities, Test and Measurement (T&M) companies are in a race to provide testing capabilities for each new technology. This means that the T&M companies who offer signaling testers keenly follow and contribute to the development of the industry standards while building relationships with players across the ecosystem. T&M companies have a unique view of the ecosystem which enables them to provide technology support many months before it is deployed in commercial networks.

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Speed

A commercial signaling tester is typically supplied with an Application Programming Interface (API) to help you quickly create tests to meet your own specific objectives. It is supplied with analysis tools designed for purpose that will help you to identify the cause of problems. Signaling testers will resolve unexpected issues in a fraction of the time taken with other solutions.

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The test campaign managers and UE automation interface provided by a commercial signaling tester will also help to speed up the testing cycle and reduce your time to market.

Automatic test sequencing and features that support unattended operation allow tests to be run while your engineers are sleeping.

Business Focus

Only a large number of development-years combined with the insight gained from deep, long term customer relationships will result in a signaling tester that offers the required level of features and capabilities. If you invest in signaling testers from a trusted specialist you can focus your precious resources on core revenue-generating activities.

Scalability

Signaling testers come in a range of price vs. performance options, starting from single cell simulation for initial feature verification, through to multiple cells of different radio technologies to test complete device performance. Mobile devices are typically designed by relatively large organizations across multiple geographically dispersed development and test teams. Standardizing on a signaling tester platform for your organization will allow you to easily and cost-effectively replicate test stations so that all team members have access to exactly the same test environment. Many users will be able to work in parallel across a number of different sites - and still achieve consistent test results.

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SUMMARY AND CONCLUSIONS

Developers of mobile wireless chipsets and devices are facing increasingly difficult challenges to deliver quality, leading edge products on time and in budget. Successful organizations set business goals to identify and fix problems early and to implement correctly the first time round. They will hire world-class engineers and equip them with effective development tools and test solutions. There are several alternative solutions available for testing wireless protocol implementation, but significant benefits will be gained by adopting a purpose-built signaling tester as the heart of a successful UE development and testing strategy.

The signaling tester hardware and its associated software tools are available at a range of price vs. performance points.

When you are selecting a signaling tester it is important to stay focused on the business goals and consider the extent to which each alternative on offer will maximize the benefits to your organization. You need to ensure that it offers the required technical capabilities. You will need test development environment that is easy to use with the desired level of control. The right signaling tester may represent a significant investment, so it is important to select a platform that has a road map to support future technology evolutions. It is also critical to select a trusted supplier with whom you can develop a long term relationship.

To find out more about Anritsu’s range of world-class signaling test solutions please visit www.anritsu.com or contact your local sales representative.

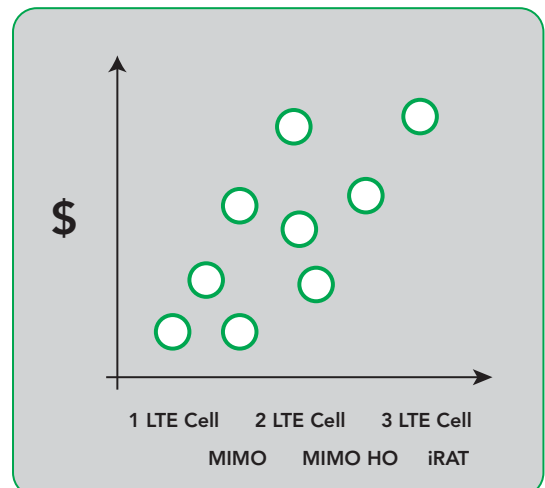


Figure 3 - Signalling testers are available at a range of price vs performance points

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