Can test equip

Representatives from all the groups involved in the development and deployment of next generation infrastructure met for a roundtable discussion, sponsored by Tektronix. The debate was lively and revealed common areas of concern and a requirement for changes to the processes previously associated with the testing of mobile infrastructure. Catherine Haslam reports.

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The initial response from the experts gathered to discuss the way in which 3G infrastructure should be tested, was that introduction of any new technology brings massive challenges but with UMTS infrastructure these are greater than ever before due to the incredible complexity of the technology. They further agreed that there was pressure for these to be overcome in a shorter timeframe than has ever been contemplated before, let alone tried.

Vodafone's Peter Brown summed up the challenge from the perspective of one who lived through the introduction of GSM. "Let's be honest, GSM didn't work for several years. It took three years to get it to work reliably and we are still improving it, even now. To expect 3G to be working reliably from the moment it's deployed, is asking a huge amount of everyone around this table and in the industry as a whole."

Sitting at the heart of that challenge is testing — the tools and processes required to prove what is and isn't working — and the discussions on that centred on three main areas: conformance, performance and interoperability. This in itself is a shift recognised by Brown who suggested that, "The days of generic requirements for test equipment are gone. These now change depending on where in the development and deployment cycle the user is."

In terms of conformance, the biggest hurdle to be overcome is that of complexity and, according to Ali Pourtaheri of Mycom, this is yet to be fully recognised, "The industry is significantly underestimating the effect of the new air interface technology of W-CDMA. It is ten times more difficult than GSM…and it is counter-intuitive."

Proving products; raising the bar

Inevitably, this makes product development more difficult and the pressure is being pushed down the supply chain. "From our point of view, we are trying to push as much of the compliance and performance testing to the manufacturer as is possible," said Brown.

It is a trend all too familiar for Lucent's Roger Derrien. "From day one, we have to deliver a certain level…The complexity of how we test the system has increased significantly. We have broken the process down. Firstly, we test during product development, then we do network element tests to ensure the elements work. Next we do network cluster tests to see how different elements work together, then we test the network as a whole and finally we do application tests.

"The complexity of this testing right now, is the biggest effort we have. The amount of test cases runs into the tens of thousands and the time, resources and people involved has grown significantly."



He went on to set out his basic requirements from a test partner stating, "I need simulators. I need performance testing tools and I want to reduce my capex as much as I can. So my dependency on a test partner is critical, creating a situation where we solve problems together. More of a complicated team make-up is going to become more typical."

Being unable to deliver test products long in advance of the time they are required is a fact of life in the mobile industry today. The same complexities that confront infrastructure vendors also afflict test equipment developers. The UMTS standards are changing and so are the interpretations and understanding of them. Therefore, as Derrien explained, "Test equipment can't be that far ahead." RFI's Colin Forrester added, "It's a chicken and egg situation and the test equipment developer also has to go through a validation process, so it can't deliver a long way ahead of time." Hans-Peter



ment match the 3G pace?

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Kuhnert of Tektronix summed up the effect of this stating, "We, as test equipment providers, can no longer upgrade equipment three times a year and leave it at that. We have to be very close to the equipment vendors and the operators. It is now essential to be more of a partner."

Beyond the air interface to the core

Neither do the problems stop with the air interface. The core network is expanding at a rate that demands attention and care. Neil Haydon of Tektronix explained how IP, something that in theory simplifies matters, is causing a deal of confusion. "In the core there are still legacy networks which all have to be supported, which is complex and while, in theory, IP is simple, pure IP is a long way ahead. It is not really understood by anyone how complicated managing the transmission is going to be. With 3G comes a massive increase in capacity, and we are effectively moving away from SS7, which has been around for a long time and been the glue that's driven the whole thing. This problem isn't going to go away very quickly."

Brown agreed stating, "The core infrastructure is becoming infinitely more complex and is where we see the convergence between telecomms and IT." Kuhnert further identified the arrival of new players as a driver for consistent protocol testing and monitoring tools and one which could spark the entrance of new players into the test market, "It is similar to the fixed network market with the arrival of gigabit Cisco routers. The need to test these led to the introduction of new test tools from new entrants."

Converging technologies; conflicting demands

The impact of this convergence and the growing complexity in radio and core infrastructure has two distinct and conflicting consequences. The first is that the test equipment itself is becoming ever more sophisticated and complicated, while the time and resources that can be devoted to testing, particularly within operators' businesses, is reducing.

As the discussions continued, it became increasingly clear that the comms/IT boundary was not the only one that was blurring as a result of the introduction of 3G. As has already been alluded to by Brown and Derrien, the lines between product development and deployment are constantly being crossed as the pressure mounts on vendors to guarantee levels of performance from their products. But, as Pourtaheri says, "If operators demand certain levels from their suppliers, how are they going to measure them?" Neither does the need to test performance stop at installation; it continues through deployment. Furthermore, testing performance is not simply a case of testing the various elements and aggregating the results; it's about showing end-to-end views of real network behaviours. Said Brown, "We are moving away from little bits and pieces of test equipment to big test systems which are effectively a microcosm of a network." Derrien continued, "You have to load spread spectrum technologies or simulate load

Attendees

Neil Baucutt, O2
Neil is UK technical network quality and performance manager for O2. He has previously worked as a test engineer and therefore has a considerable amount of hands-on experience of rolling out and managing mobile networks.

Peter Brown, Vodafone
As Head of Service Quality Assurance for Vodafone UK, Peter is responsible for measuring customer experience. Peter has worked for Vodafone for over 17 years joining the Engineering Radio group at Racal Vodafone in November 1986 and embarking on a trail blazing career in Network Operations Management.

Roger L. Derrien , Lucent Technologies
Roger Derrien is the vice president for UMTS Product Management at Lucent and is responsible for introducing and managing the company's UMTS product portfolio. This role also includes responsibility for Lucent's IN and GSM product portfolio.

Roger joined AT&T Bell Laboratories in 1988 and gained extensive wireless and CDMA experience following his move to the wireless business unit in 1990 where he held several critical positions in project management including being responsible for the introduction of the first generation TDMA (IS-95) networks in North America and the internationalisation of the AMPS/PCS product line .

Colin Forrester, RFI
Colin is Business Area Manager for RFI's Cellular Services, covering compliance and market requirements for Cellular Terminals and Base Stations.

Colin has also been working in the Type Approval of Cellular terminals arena for five years, and looked at the development of test scripts for conformance and field trials. He is an active member of GCF and PTCRB.

Neil Haydon, Tektronix
Neil Haydon is Strategy Director for Tektronix's monitoring protocol test business based in Berlin, Germany. While at Tektronix, Neil's other roles have included Director of EMEA Marketing and Director of Sales.

Hans-Peter Kuhnert, Tektronix
Hans-Peter Kuhnert is Sales Director for Tektronix Network Diagnostics in Europe. Based in Cologne, Germany, Hans Peter joined Tektronix in 2002. Previously, he worked for Hewlett Packard/Agilent for 13 years, where his last position was Director of Sales for its communication business in North and Middle Europe.

Ali Pourtaheri, Mycom
Currently working as a consultant to Mycom International as it builds a technology services business, Ali Pourtaheri has a history of founding and growing cutting edge wireless technology companies, including Ubinetics, which developed 3G test mobiles and 3G intellectual property.

His wireless experience began in 1991 at Ericsson where he was heavily involved in the development of Ericsson's GSM network products. His achievements have also seen him named on the GSM Association's Role of Honour.



Tektronix provides a range of protocol analysers which work across all radio technologies, all layers and all applications, to test the capabilities of new and existing networks and gateways.

to test networks, otherwise the problems will be hidden until the networks get live loadings."

It is a demand that is impacting significantly on test equipment vendors. According to Haydon, "Most of the test tools we have seen developed in the past have been designed to look at and measure the transportation and therefore there has been a concentration on network elements." He continued, "For voice, looking at SS7 was as much as you needed to do sometimes because you had the power to see that the circuit was connected. Now, you go packet-switched, and you don't necessarily have the connection all the time. The other thing is that the testing issue is no longer just about routing but also what happens in the payload and making measurements from that. You have to look inside again. This will impact on test manufacturers because they will have to find ways of not just looking at the physical side but also on the services side."



As Neil Haydon explained, "The complexities of the technology mean that test equipment has to be sophisticated enough to function as network infrastructure in order to be able to test it."

Pourtaheri went on to suggest that, "The applications and software are constantly changing and, therefore, you can't have fixed entity test tools. They need to be continuously updated…They need to learn and for the information they receive to be stored in the equipment, not by a few experts." O2's Neil Baucutt then put the need for such tools into perspective when he said, "It can take maybe a day to analyse all the data for a single call — that is just not feasible going forward as we don't have the manpower to interpret that data. What we need are tools that almost give us a red, amber, green view of the network operation. These can be taken by a less skilled person who makes the early decisions on what needs to happen and then maybe an outsourced contractor can deal with the detail, depending on how you want to organise your operation."

Interoperability: a recurring headache

The final, and perhaps most obvious headache discussed by the assembled experts was that of interoperability. "Operators want to have the latitude to select multiple vendors in the network . They want a competitive environment but also to know that the equipment is compatible. Getting vendors together to deliver this takes a lot of time and effort from the operator," explained Derrien.

The reason it takes such concentrated work is that, while standards provide a common starting point, they are far from the end of the story: the UMTS standards are open to interpretation and therefore products can easily become incompatible. Pourtaheri put the situation in perspective stating that, "With GSM it was horrible, particularly the interoperability between handsets and infrastructure from a different manufacturer. For 3G, some interoperability provision is included in the standards but this is far from being enough…Actually getting base stations to a level where they meet common interpretations still has to happen."

The group was, however, united by a common belief that this is an area in which the industry as a whole could play an important role by providing a clearer structure for proving interoperability.

Test vendors have pivotal role

Derrien began by suggesting that it's a process for which test OEMs could sit at the heart. He said, "A standard is a start but there are many different interpretations of the standard...I thought we understood spread spectrum technology well and that we understood the standards but they are quite vague in places. I think we have a lot of different interpretations in the industry and I think our test OEM partners can help to get us through that. As Lucent, we can go into a lab with the Nokias, Ericssons, Nortels etc., — that's one way to do it. But if the test OEMs can take their knowledge of a vendor and its interpretations and fit that against a common set using a common set of tools...That would help us all significantly." He even went as far as to suggest that there is a need, "To get there as an industry and create a clearing house for conformance testing." This would manage this information and ensure common test cases are used, as exists for 3G terminals.

A possible objection to following the terminals market interoperability provision is that it will delay unnecessarily the availability of equipment as there are so few infrastructure vendors in the market. However, Forrester of RFI, which is one of the official test houses for 3G terminals, was not convinced by this and stated that, "There should be something official as there is with the handsets. There certainly are fewer players in the infrastructure market but so were there in the handset market several years ago and it was still necessary then. It is something that needs to happen."

Parting shots

There were two clear themes which came out of the discussions. The first was that mobile infrastructure in the RAN and the core is increasing in complexity almost by the day and that, in turn, impacts on the way in which test equipment is both developed and used. The second was that the market is demanding more advanced testing tools which can, to all intents and purposes, replicate live networks on the one hand and monitor them end-to-end on the other.

This implies the creation of immensely complicated and probably expensive test equipment, something which Haydon believes could bring its own problems. "It is often difficult for people to understand what they see on complicated test equipment and what it means...In the future the technology will become more complex but, as test people we can't follow that complexity indefinitely, as we could run out of people who can use the equipment."

The conclusion was that, in the long run, test equipment OEMs would have to do things differently but for now the emphasis has to be on providing the right tools at the right time. To do this infrastructure vendors, test vendors and operators have to work together in partnerships to deliver the best equipment in a timely way. Kuhnert summed this up stating that, "When I talk to customers today, I am no longer doing so as a test and measurement provider but as a partner.

"Any test and measurement vendor that wants to be successful in this market has to focus and not look at too broad a portfolio. Then they have to be a partner to the vendors on the one hand and operators on the other. Only then can we deliver what you want, when you need it."