Test Path to 3G Leads to Flexibility and Multi-standard Instrumentation

By Yuenie Lau, Anritsu Company
The migration to 3G (Figure 1) is littered with a variety of standards, none of which is the definitive answer that will be used globally. As we have gone from 2G to 2.5G formats, designers have been faced with the challenge of developing products for multiple standards. Seemingly, that challenge will continue as 3G emerges because formats such as cdma2000 1xRTT and W-CDMA are likely to share the spectrum rather than one being adopted as the single global standard.

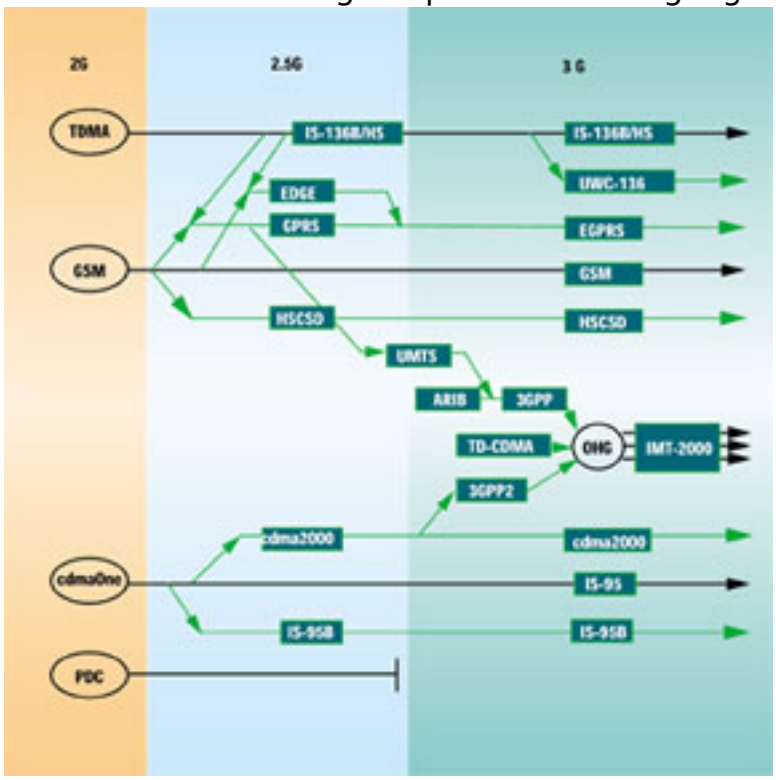

Figure 1. The Road to 3G

There is little doubt that there is a need for data services such as instant messaging, e-mail, Internet access, and video downloading. The question, however, is to what degree and in what format. Multimedia wireless services will be marketed to the masses at both the consumer and business level but it will probably be done without a seamless transition. Rather, we are faced with the prospect of ubiquitous worldwide coverage utilizing many different formats.
Despite these uncertainties, engineers and companies continue to design and manufacture products that will continue this evolution of wireless technology. Most people understand that the challenges in developing 3G mobile stations go beyond features and functionality. Manufacturers must develop products based on multiple standards in order to be successful in the market.

Test Equipment Gets Flexible

Test instrument manufacturers are no different in this respect. Whereas companies designing and manufacturing 3G products for commercial use must continue to be

flexible, so too must test companies. After all, test companies have to sell solutions that meet the needs of their customers and their customers are developing products for a variety of standards. Furthermore, test companies must design test instrumentation to be cost-effective, especially in today's market.

Because the multi-standard dilemma is not new, test companies have experience designing instrumentation to accommodate multiple standards. Single instrument solutions are now available for R&D, manufacturing, and field use that have the flexibility to analyze multiple standards. The single instrument design and the flexibility meet the testing requirements in a cost-effective manner, as well as provide a space savings to rack-and-stack alternatives.

At the R&D level, signaling testers alleviate the difficulties and expense of analyzing the performance of mobile stations and mobile station chipsets. Simulating a base station, these single instruments accommodate modules based on industry standards. These signaling testers can be used to verify the modulation and demodulation function of the mobile station or chipset, confirm call processing functionality between the base station and mobile station, and can simulate applications &#151 all in the lab.

Further expanding the flexibility of these instruments are software packages, which help comprise a family of test and verification tools available to manufacturers of next-generation wireless products. All the software tools can work with the signaling tester, providing a common user interface to reduce operator training and expense. For example, W-CDMA Virtual Signaling Tester (VST) software is available based on 3GPP Layer 3 and Layer 2 signaling protocols to conduct signal verification and validation on mobile stations. Complementary Protocol Test System (PTS) software is also available. Because the VST and PTS are software, their capabilities can evolve and expand in accordance with the 3GPP specifications.

Similar modular designs are used in digital modulation signal generators so that a single instrument can generate a number of complex signals required for the development of digital mobile communication systems and related devices. These signal generators cover the 250 kHz - 3 GHz frequency range so that they can address all the major mobile communications systems. They utilize quadrature vector modulation to provide high-quality frequency and distortion characteristics, and excellent signal-to-noise ratios. The design allows the signal generator to accommodate up to seven modulation units, so it can meet all present requirements, then be easily upgraded to analyze future communications systems.

Manufacturing test solutions are also single instruments but they do not necessarily need to have the same modularity. Rather, software based on virtually all the global 2.5G and 3G standards is used because the testing requirements are more of the Pass/Fail variety. The appropriate software is simply installed into the instrument and testing can begin. The most popular single-instrument solution for the manufacturing environment has become the radio communications analyzer. Its popularity stems from its versatility. While it is a single instrument in appearance, it has the performance of eight different instruments.

Coupling such measurement capability with software designed for specific formats allows manufacturers to produce mobile stations based on various standards on the same line without switching test instrumentation. It also allows testing to be conducted in an efficient manner because it eliminates the need for a suite of instruments. The result is tremendous cost and space savings, both of which are at a premium during manufacturing.

Field instrumentation has less emphasis on analysis and more on simplicity. Nonetheless, it must offer the flexibility to test 2.5G and 3G base stations, regardless of standards. Because of the signal complexity, there is a greater need for spectrum and area coverage analysis. A handheld spectrum analyzer is now available that has the same look and feel of the most popular handheld cable and antenna analyzers used for 2G applications. Therefore, technicians will not have to undergo significant training to make the next step for field testing when 3G is widely implemented.

Conclusion

The likelihood that a single standard will be used to provide seamless worldwide access to voice, data, and multimedia via a mobile station is slim. History has shown that a variety of standards will most likely be used to provide consumers with these services. Mobile station manufacturers are preparing for the latter scenario by developing products based upon many of the standards.

Anritsu Company's MD8480A

Test instrument manufacturers are providing flexible solutions in order to accommodate their customer base. The test instruments being used for 2.5G and 3G applications are designed to offer a variety of solutions in a single instrument. This is being achieved through modular designs that allow expansion slots to be easily inserted as standards evolve. It is also being realized through the development of software products that expand an instrument's measuring capabilities in a cost-effective manner. The creation of these product families that provide a common user interface with a wide degree of testing flexibility is proving to be the most effective way to conduct accurate analysis of next-generation signals and products.

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