GPRS quality-of-service testing — the experience so far

Raymond Wu of Ascom takes a look at GPRS network performance as revealed by quality-of-service measurements. The improvements are obvious all round.

By Raymond Wu

From the early days of GPRS deployment, the critical questions were — does it work at all?, and if yes, how well does it work?

GPRS networks are improving, but there are noticeable differences between infrastructures from different manufacturers

Ascom QVoice was the very first drive test tool to offer GPRS quality-of-service (QoS) measurements, and the results reveal many interesting aspects of GPRS network performance. QVoice has measured a large number of live GPRS networks in different continents, and the results can be divided into two groups: subscriber view and engineering measurements.

GPRS subscribers are primarily interested in GPRS coverage, time (and ease) of setting up data transfer sessions, user data throughput rate, and whether the session is stable.

Measurements so far show that GPRS coverage is uneven: most networks measured either have GPRS coverage 'islands' (where GPRS does not cover the whole network), or for any given base station, have GPRS on some channels only. The first is well known to cellular network operators and the coverage will no doubt be expanded rapidly. The second causes some very interesting effects and what happens in practice depends on the interaction of the GPRS handy and the base station. Field drive tests lead to the conclusion that base stations with GPRS on selected channels only is best avoided.

User data throughput rate is perhaps the ultimate test and the good news is that over many months of live measurements, one can see that throughputs are increasing. The not-so-good news is that it is increasing from a modest base, and so efforts to improve continue to be a high-priority issue.

Stability is affected by many different situations the unexpected loss of PDP context, the problems associated with crossing routing area boundaries, the attach rejects and so on. Here again, the picture is encouraging — from the early days where QVoice measurements reported unstable sessions, even in operator's laboratories, to today where in some better networks, field drive tests can be done for an hour or more without any network problems.

While these 'subscriber view measurements' give us an idea of how the user would see the network, engineering measurements help the cellular operator to understand where the problems are, and enable him to see if network changes actually bring any real improvements.

The first measurement most operators would do is 'round trip delay' by using PING messages. Looking back over many months of measurements, one can see that most networks would have round trip delays of one to two seconds. This is measured between the GPRS handy and the GGSN i.e. the entire GPRS path under the control of the cellular operator. It is rare to see PING delays of less than 800ms, while the maximum delay could be higher than 2 seconds. The most interesting observation here is that infrastructure from different manufacturers almost has its own 'signature'. Not only are the length of the delays different from manufacturer to manufacturer, but the distribution of these delays are also different, i.e. not all of them show the normal distribution curve.

Summing up the experience so far, one can say that GPRS networks are rapidly improving, but there are noticeable differences between infrastructures from different manufacturers.
As the GPRS technology gradually matures, maybe these differences will narrow down and the subscribers can expect a reliable and high-speed service everywhere. ☐