3G – 2G Interworking: Handover and Reselections

Existing 2G networks were not designed to support enterprise applications or mobile multimedia for the mass market. 3G is the next step in the evolution of mobile services. It provides mobile services that are driven by the capacity and speed that data-based services demand from the network. But, there is a cost implication to rolling out a nationwide 3G network.

To minimise the cost impact of launching a new 3G network and to maximise existing investments in 2G infrastructure, operators will need to support their current subscriber base on both GSM and UMTS. This will allow operators to offer uninterrupted service as they transition to 3G. Migrating to wireless data network technologies such as UMTS can position operators to boost capacity, and significantly reduce capital outlays and the cost of delivering traffic across their networks. This raises considerable challenges for operators due to the complexities between GSM, (E)GPRS and UMTS networks. There needs to be a seamless interworking between 3G and 2G bearers so that end-users experience a faultless quality of service no matter which technology is being used.

Optimising the networks to ensure that your customers receive a consistent quality of service, regardless of whether it is 2G, 2.5G or 3G, is a priority for every operator. Without sufficient attention, users could experience 3G call drops, (data and/or voice), reduced 3G voice quality, and 2G call drops following a handover from 3G.

Staying competitive, attracting new customers, preventing churn and growing revenue are all benefits of working with Commsquare’s consultancy team to optimise your 3G-2G interworking.

The Details

By correctly tuning the network, you will ensure that your customers are receiving the quality of service that is expected. Optimally managing traffic/capacity between the 2G and 3G radio access technologies requires that traffic planned for a specific network layer remains on that layer or that it is handed back as soon as possible. For example, a mobile in idle mode with a packet switched data user profile that has reselected a 2G cell returns as quickly as possible back to the 3G layer. Ensuring that handovers and reselections occur correctly is the key to mitigating situations of cell overload/congestion.

To perform an interworking audit, Commsquare will analyse several areas of your network. The complexities of the 3G-2G, 2G-3G handover performance and 2G-3G and 3G-2G cell reselection performance will be analysed. During this period of analysis, Commsquare engineers will review a number of possible criteria from the following:

- Drive test measurements
- Statistical analysis
- Dedicated testing

This will enable a detailed report with a breakdown of any areas requiring corrective attention in your network.

Drive Tests

Drive tests are carried out using a radio scanner to determine the distribution of UMTS coverage and quality samples in a defined geographical area. The combination of both will indicate in which areas inter-RAT handovers will be executed. This information will be overlaid on the actual handovers that are executed during the drive tests. According to the network design and parameters, Commsquare will evaluate how well the handovers are being performed.

Evaluations will include:

- Agreed test locations
- Coverage measurements
- Quality measurements
- Measurement of handover KPIs (success rate, drop rate, delays, etc.)
- Analyses of rejection and failure causes on the basis of coverage and quality criteria as well as neighbour relations
- Proposal of corrective measures

Statistical Analysis

During a specific time period, for example one day, Commsquare will collect all of the relevant signalling data from both packet-switched and circuit-switched traffic from one or more network interfaces. The resulting data is processed during which time 2G-3G signalling information is filtered and statistical analysis is performed to provide an overview of success and failure rates for 2G-3G interworking, including handovers and cell reselections etc. By examining the data from the Iub, Iu-PS, A and Iu-CS interfaces, you will see a clear picture of interworking successes and areas where it is unsuccessful. From this data, Commsquare will ascertain whether your 2G-3G interworking is operating at the planned levels, whether it is less than or in excess of the levels you require.
The statistical analysis will generate the following:

- Validation of all procedures at all different protocol layers at agreed interfaces
- Calculations of KPIs at all levels
- Analyses of reject and failure causes and identification of root causes
- Proposal of corrective measures

**Dedicated Testing**

During the statistical analysis, specific problem areas will be revealed, by performing dedicated drive tests in those areas using a dual mode test mobile and a test server connected to the core-network accessible over both the 2G and 3G access networks. During the testing, the handover and reselection behaviour will be tested for both circuit switched and packet switched services. From the relevant interfaces, our engineers will collect signalling traces for the test mobile and further analysis will be carried out. With this information, our team will perform drill down analysis to reveal the root causes of any under- or non-performing 2G-3G interworkings. By executing this level of detailed analysis, you will be able to view the measurements for the timer-values, handover-relations and network parameter settings that control measurement and handover procedures.

Dedicated testing will included the following:

- Agreed test areas
- Static and mobile test set-up
- Tracing of test mobile IMSI on relevant network interfaces
- Video calls
- PS/SCS calls (streaming etc.)
- Ping analysis using different payload sizes
- FTP/HTTP upload and download
- Validation of all procedures at all different protocol layers at agreed interfaces
- Analyses of reject and failure causes and identification of root causes
- A proposal of corrective measures

**KPIs**

Performing an audit of this type will generate a set of key performance indicators including:

- Handover success rates
- Handover delay time
- Reselection delay time

- The average radio bearer throughput reduction as a result of 2G-3G interworking
- The average duration a connection is maintained on a designated technology layer

Our in-house software tools will be used to collect and analyse many gigabytes of data from a wide variety of interfaces in a very short space of time and, once complete, we will:

- Work with your team to provide a technical workshop and presentation of all results to your engineering team.
- Prepare a comprehensive document stating the results on overall 3G-2G handover performance, together with our recommendations for improvement.
- Present to your management team on the results and recommended course of action for improvement.

These recommendations are prioritised according to your KPIs and requirements.

**Ongoing Support**

As your technology partner, Commsquare offers you the ability to evaluate your network, and then, continuously re-evaluate its performance on an ongoing basis. We work with your engineers to ensure that they have the tools and know-how to make the necessary changes to the network for increased performance.

**Knowledge Transfer**

Working with your engineers, we aim to ensure that our experience of your network is transferred to your teams and that your engineers are given on-the-job coaching and finally that you have a clear understanding of the process and results obtained.

**Next Steps**

Are you delivering on the promise of UMTS? Are your corporate users getting the quality of service that is paid for? Do you believe that your network is performing to within system limits?

To learn more about Commsquare or to speak with someone from our team, please call

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