Zeitschrift: Comtec : Informations- und Telekommunikationstechnologie = information and telecommunication technology

Herausgeber: Swisscom

Band: 75 (1997)

Heft: 1

Artikel: To insure a proper handover activity

Autor: Jung, Pierre

DOI: https://doi.org/10.5169/seals-876907

TUNY, A NEW GSM HANDOVER TUNING TOOL

TO INSURE A PROPER HANDOVER ACTIVITY

At a time where the Global System for Mobile communications (GSM) network is almost fully implemented, one of the upcoming aspects in the maintenance activity of a GSM operator certainly is *network quality management.* Here we will consider the tuning of the GSM network in such a way that the operator can define the geographic locations where a mobile station (MS) changes its link from one base station (BS) to another, i.e., in other words, where a *handover* most probably will occur. This tuning operation is called *handover tuning.*

PIERRE JUNG, BERN

Usually the handover tuning operation is carried out preventively in a given area in order to insure a proper handover activity between the mobile station (MS) and the base stations (BSs), so that the probability for bad communication quality or even call loss is minimized. Handover tuning becomes very important when customers begin to complain about call losses in their communication. The handover tuning is composed of three steps:

- First, the operational department undertakes a series of *field measurements* with a specially equipped van actuating as a MS. Among the measured data we have the reported GSA signal strength, quality to the serving BS as well as the signal strengths to all of the neighboring BSs, the GSM messages exchanged between the MS and the BS, geographical location, video, speed and time data.
- Thereafter, the operator may *analyze* the handover events while replaying the *measured data* in the labs. He may furthermore *modify* the *BS parameters* of the BSs and *simulate* the *new handovers* that will result. This parameter tuning is carried out iteratively by the operator in order to make the handovers most likely occur in some specific geographical location.
- Finally, when the operator is satisfied with the new handover situation, he will *set* the *BS parameters* in this region of his GSM network to the optimized values he found out during the simulation.

Tuny project

Since BS parameters settings may affect a whole region of the GSM network, it is vital to optimize and verify the latter offline with a *handover simulation tool* before setting them in the real network.
Such a handover simulation tool *(Tuny)* has been developed at *FE422* and been delivered to our GSM operator *(MC124).* It consists of a 32-bit software package that runs either under Microsoft Windows '95 or Windows NT 3.51 or NT 4.0 on a desktop PC or on a Pentium laptop, so that it may be used in the labs as well as on the road. This tool is shown in the picture.

Handover tuning tool

The tool mainly relies on *two input files:*

- the *MS measurement data*
- the *BS parameters* from the GSM network

It displays this data in a convenient way to the operator through a well-designed graphical user interface (GUI). The main screen displays a map of the route, followed by the MS during the measurement. Measured data and BS parameters are presented in specific windows. A moving crosshair indicates the current MS location on

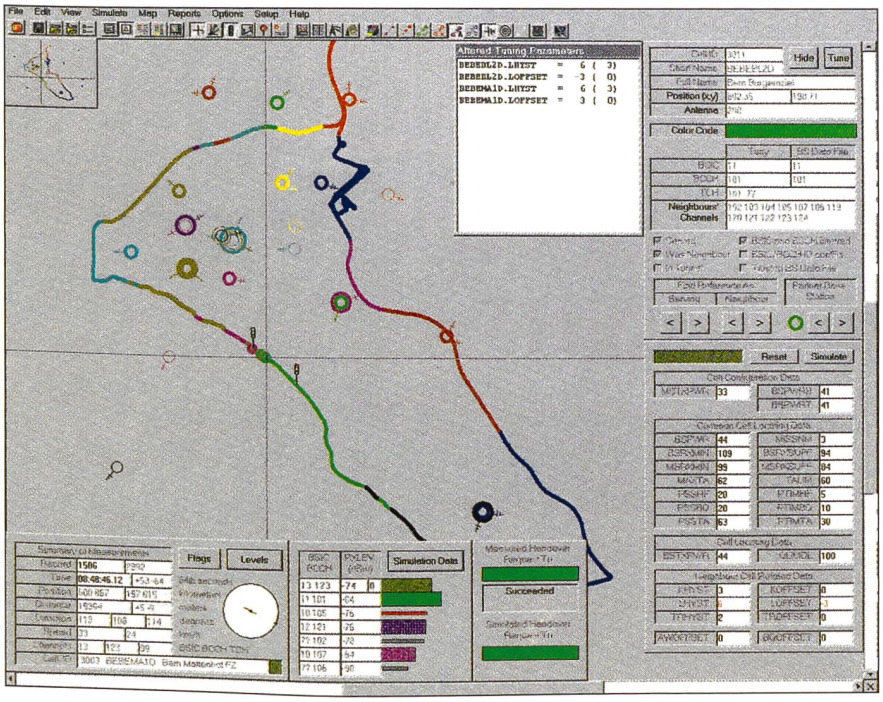

Fig. Handover simulation tool 'Tuny'.

files (from Bosch, Orbitel and now from AEG test MSs) ranging from mid-1995 up to now. A first real GSM network *successful tuning verification* has also been carried out near Bern in June 1996. The handover simulation and BS tuning were performed directly from the measurement van on a Pentium laptop.

Project extensions

This project will be *extended* to an *integrated handover tuning tool (Tuny 2).* For the time being, the measurements are still carried out with a third-party real-time measurement software which does not work satisfactorily and introduces many data synchronization errors in the MS data files. These errors need to be corrected by the simulation tool, before they can be used for BS parameter tuning. The time resolution of this third-party tool also allows to record only every second measurement report from the MS. With Tuny 2, the real-time measurement, navigation, advanced display and simulation functions will be integrated into one software package. This package will remain compatible with the present data file format, so that it is possible to use it from now on for handover tuning, and it will be upgraded with the introduction of new functions. The compatibility is also mandatory because of the data display software already widespread in our TDs. 4, 9.3

ZUSAMMENFASSUNG

Tuny, ein neues Werkzeug zur Adjustierung des Handover im GSM-Netz

Zu einer Zeit, da das Global System for Mobile Communications (GSM) fast schon voll implementiert ist, ergibt sich als neuer Aspekt im Bereich der Betriebsüberwachung die *Überwachung der Netzqualität* durch den GSM-Betreiber. Ein wichtiger Parameter betrifft beim Zellularfunk das sogenannte *Handover*, bei welchem eine Mobilstation (MS) von einer Basisstation (BS) auf eine andere wechselt. Im Artikel wird beschrieben, wie mit dem Werkzeug definierte geographische Orte ausgewählt werden können, an welchen ein Handover stattfinden soll. Parameter im GSM-Netz werden sodann durch eine Bedienungsperson so adjustiert, dass ein solches Handover mit grösster Wahrscheinlichkeit an diesem Ort stattfindet. Die Adjustierung wird als Handover Tuning bezeichnet.

the route and synchronizes the figures in the specific data windows. The operator may zoom in this map to get more detailed route information. The route is itself composed of several colored segments, corresponding to that of the BS (colored circles) which served that route segment. The direction of the antennas on the BSs may also be shown, providing supplementary information to the operator. In order to get specific MS-measured, simulated or BS network data, the operator simply clicks the mouse while he lets the cursor point to the MS route, BS or any other graphical object on the main map. A medallion map tells the operator where he stays within the whole route when zooming in the map. The operator also has several functions, allowing him to analyze and to modify this data graphically, as well a simplified version of the Ericsson handover algorithm running in the base station controller (BSC), allowing him to simulate the new handover events caused by the modified BS parameters.

The *output* consists of a set of *tuned BS parameter* values that are saved in a file, together with the new, *simulated handover locations.* These parameters are then ready to be set in the real network.

Tuny has already been *successfully tested* with former measurement data

Pierre Jung received his diploma in Electrical Engineering at the Swiss Federal Institute of Technology (ETH), Lausanne, in 1986. After he gained experiences with Siemens-Albis and Ascom. Currently he is with the System Aspects and Spectrum Sharing Group within the Mobile Communications Section of the Swiss PTT R&D, where he manages software projects in the area of mobile network and service quality management. He is also active in the area of simulation of global mobile communications networks, where he developed fast simulation methods in order to figure out the transmission quality, e.g., for the RACE-UMTS project.