COMPASS WIRELESS FOR GSM IDENTIFIES HALF RATE/FULL RATE CONFIGURATION PROBLEMS

Challenge of tuning network elements for full rate/half rate speech

One of the most important aspects of configuring a GSM Base Transceiver Station (BTS) is the conditions under which the BTS provides full rate and half rate service to mobile stations. Full rate is the original GSM digital speech coding standard and has a bit rate of 13 kbps. Half rate is a speech encoding system developed in the early 1990s that operates at 5.6 kbps, doubling the network capacity for voice traffic at the cost of some reduction in audio quality. Network elements are often configured to set up calls as half rate or full based on the current traffic load. In a typical situation, technicians might configure the switch to set up all calls at full rate until the switch reaches 70% of its full rate capacity. At that point, all new calls would be set up at half rate. This will greatly reduce the danger of annoying customers by dropping their calls at the risk of a minor reduction in call quality.

Tuning the network elements to maintain an optimal balance between half rate and full rate calls is an important part of the task of maintaining a BTS. But configuring the network elements to maintain the right half rate/full rate mix is not a task that can simply be done once and then forgotten about. The mobile environment is continually changing as new features are introduced and traffic usage changes. Vendors frequently release new software/firmware versions that provide more advanced user applications, improve performance and correct bugs from previous versions. When a network element is upgraded, the previous configuration is often lost.

Manual reconfiguration is often required to retune the network element for the particular application. But manual configurations are always subject to human error and it is usually quite difficult to verify if they are correct. Upgrades are typically done during periods when traffic is very low such as the early morning hours. When traffic volumes are this low it will be very difficult to detect the problem since all calls would normally go at full rate regardless of how the switch is configured. But it's a different story when the morning rush hour begins. If the switch is not configured correctly, many customers may experience dropped calls, resulting in dissatisfaction that might even cause them to switch to a different service.

How Compass makes it easy to diagnose and solve full rate/half rate issues

These problems and many others related to base station configuration and traffic can be easily avoided by using Anritsu Compass Wireless for GSM for troubleshooting, monitoring, and optimization. Compass goes far beyond the typical protocol analyzer by providing intelligence that identifies at a glance configuration issues and traffic patterns that make it easy to determine how well the base station is meeting the needs of subscribers. Compass processes traffic files from a wide range of Anritsu and non-Anritsu analyzers and presents the information in a way that makes it easy to diagnose problems and optimize the performance of the base station. Compass reconstructs network data into complete transactions and calls to deliver many different views into the network, enabling the engineer or technician to easily understand and diagnose the network performance. Unlike traditional drive testing that measures only a small section of the network on downlink signals, Compass generates reports that incorporate all traffic in the network and the BTS in both the uplink and downlink direction.

Compass looks at each message and determines the speech rate assigned to the call. It makes calculations based on this information that determine how many mobile originating calls (MOCs) and mobile terminating calls (MTOs) were assigned to each rate. Compass can also list the Location Area Code Cell ID (LAC CI) for each call to provide a more detailed look at traffic patterns. The speech rate distribution of calls in each LAC CI is provided by %HR and %FR columns. A typical predefined report provides a detailed breakdown of calls assigned to full rate and half rate for the entire cell or per TEI. Results can be displayed in graphical format and/or exported in CSV format to Excel for further analysis in many other applications. Compass also makes it easy to configure and define thresholds for warnings and alarms for individual cells, groups of cells, or the entire BTS. From the overview it's possible to drill down to individual calls and further to each message with full decoding to quickly determine the cause of a particular issue. The chart below shows a typical Compass speech rate assignment report.

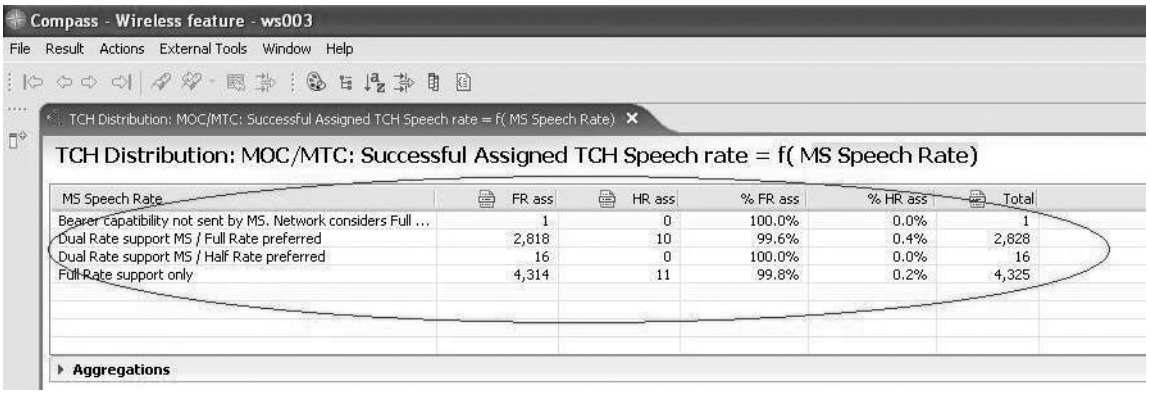
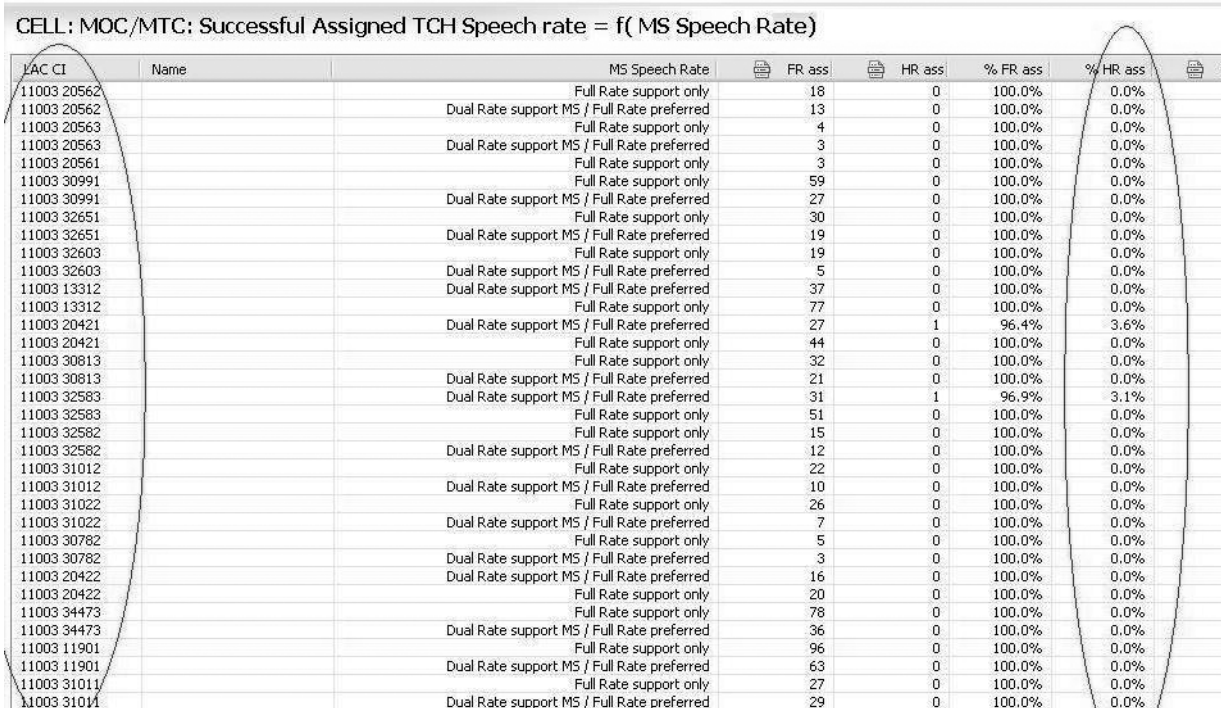


Chart shows the effect of half rate not being enabled.



LAC CI	Name	MS Speech Rate	FR ass	HR ass	% FR ass	% HR ass
11003 20562		Full Rate support only	18	0	100.0%	0.0%
11003 20562		Dual Rate support MS / Full Rate preferred	13	0	100.0%	0.0%
11003 20563		Full Rate support only	4	0	100.0%	0.0%
11003 20563		Dual Rate support MS / Full Rate preferred	3	0	100.0%	0.0%
11003 20561		Full Rate support only	3	0	100.0%	0.0%
11003 30991		Full Rate support only	59	0	100.0%	0.0%
11003 30991		Dual Rate support MS / Full Rate preferred	27	0	100.0%	0.0%
11003 32651		Full Rate support only	30	0	100.0%	0.0%
11003 32651		Dual Rate support MS / Full Rate preferred	19	0	100.0%	0.0%
11003 32603		Full Rate support only	19	0	100.0%	0.0%
11003 32603		Dual Rate support MS / Full Rate preferred	5	0	100.0%	0.0%
11003 13312		Dual Rate support MS / Full Rate preferred	37	0	100.0%	0.0%
11003 13312		Full Rate support only	77	0	100.0%	0.0%
11003 20421		Dual Rate support MS / Full Rate preferred	27	1	96.4%	3.6%
11003 20421		Full Rate support only	44	0	100.0%	0.0%
11003 30813		Full Rate support only	32	0	100.0%	0.0%
11003 30813		Dual Rate support MS / Full Rate preferred	21	0	100.0%	0.0%
11003 32583		Dual Rate support MS / Full Rate preferred	31	1	96.9%	3.1%
11003 32583		Full Rate support only	51	0	100.0%	0.0%
11003 32582		Full Rate support only	15	0	100.0%	0.0%
11003 32582		Dual Rate support MS / Full Rate preferred	12	0	100.0%	0.0%
11003 31012		Full Rate support only	22	0	100.0%	0.0%
11003 31012		Dual Rate support MS / Full Rate preferred	10	0	100.0%	0.0%
11003 31022		Full Rate support only	26	0	100.0%	0.0%
11003 31022		Dual Rate support MS / Full Rate preferred	7	0	100.0%	0.0%
11003 30782		Full Rate support only	5	0	100.0%	0.0%
11003 30782		Dual Rate support MS / Full Rate preferred	3	0	100.0%	0.0%
11003 20422		Dual Rate support MS / Full Rate preferred	16	0	100.0%	0.0%
11003 20422		Full Rate support only	20	0	100.0%	0.0%
11003 34473		Full Rate support only	78	0	100.0%	0.0%
11003 34473		Dual Rate support MS / Full Rate preferred	36	0	100.0%	0.0%
11003 11901		Full Rate support only	96	0	100.0%	0.0%
11003 11901		Dual Rate support MS / Full Rate preferred	63	0	100.0%	0.0%
11003 31011		Full Rate support only	27	0	100.0%	0.0%
11003 31011		Dual Rate support MS / Full Rate preferred	29	0	100.0%	0.0%

Table is expanded to show speech rate per cell.

Here's how Compass can protect against the scenario where a mobile operator upgrades the software for a network element and forgets to reset the parameter that sets the speech rate threshold. The technician could be instructed to check the half rate/full rate report on Compass each time the configuration changes. If the results don't match, then the technician can immediately check the configuration rules applied to associated network elements. Better yet, Compass can be used on a regular basis to monitor performance of full rate/half rate call assignment and other key performance parameters. Some operators perform half rate/full rate analysis before, during and after the busy hour every day in order to ensure that rates are being assigned to traffic as intended.

Compass protects against a wide range of other wireless network performance problems

Half rate/full rate configuration is just one of the many views into the BTS provided by Compass. For example, mobile operators need to track changes in traffic patterns that may over time require updating network element configurations to optimal performance. Let's consider the case of a base station located on the edge of a metro area where there is considerable open space for development. Traffic in this area has been low and grown only slowly over the past several years so the switch has historically been configured so that all traffic is carried at full rate. But construction has just been completed on a new shopping mall and when it opens up the base station experiences a rapid rise in traffic.

The performance engineering department had plotted expected traffic based on the much slower increases in the recent past so it was unprepared for the change. The rise in traffic only became apparent when customers began complaining about dropped calls. Technicians fixed the problem by reconfiguring network elements for a half rate threshold of 50% but by the time they had taken this action many customers in the area had become dissatisfied with the mobile operator's service. Compass could have easily prevented this problem by providing alerts as traffic reached predetermined thresholds. When technicians received alerts from the cell, they could have run a trend analysis based on the latest traffic information and determined that the full rate/half configuration needed to be updated.

Compass combines more than 600 statistical processing tools for GSM, GPRS and UMTS. Technologies and network interfaces are supported via a plug-in license structure that allows you to easily select that exact technologies you need to troubleshoot, monitor, and optimize network performance. Compass has a huge list of predefined statistics and key performance indicators (KPIs) including analysis of dropped calls and handover problems as well as analysis of path loss and neighbor list. Advanced aggregations and filters can be made on another of the more than 300 sheets and tables provided with Compass. Many of the sheets and tables already have predefined aggregations and filters but you can add additional aggregations and filters easily by generating the correct expression. A wide range of warnings and alarms are offered such as threshold exceeded, occurrence and absence of particular events, parameter discrepancies and TRX alarms. With its ability to analyze roaming behavior and location updates, Compass helps predict which cells may acquire new roamers and which cells are likely to lose roamers.

In summary, Compass helps improve QoS and QoE to subscribers by easily verifying network element configuration, identifying changes in traffic patterns on a timely basis and providing early warning of most any network performance problem. Compass provides the ideal tool to address the full range of network issues such as dropped calls, poor network coverage and reduced call quality. So it can help mobile operators maintain high network and service quality and retain high revenue customers.

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Specifications are subject to change without notice.

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