

Session Trace in GPRS/EDGE

Tracing GPRS Signaling and User Plane Activities using MasterClaw™

Introduction

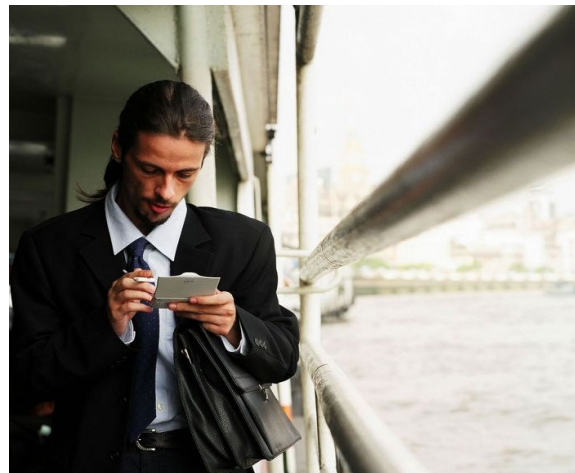
MasterClaw Call and Session Trace is the key application to track signaling procedure and correlate messages over several interfaces and protocols. This application note provides some examples and explanation referring to the GPRS/EDGE case. The application, by means of the IP Service Troubleshooting package, can also include user plane statistics, collected from the Gn/Gp tunnels, providing insight about user IP activities related to HTTP, WAP, MMS and other services. User plane important information will be therefore available, both in real time and historically.

The MasterClaw portfolio of products for GPRS also includes KPI applications Link and Message Insight, GPRS Access Insight and IP Service Insight that can indicate problems in access and core network for example regarding accessibility, setup time and throughput.

Tracing Data Sessions

With the increasing utilization of the wireless data service and with the deployment of new services like Emails, WEB, MMS and WAP it is becoming even more complex and time consuming to troubleshoot problems in GPRS and EDGE networks. Problems could be related to mobility issues, to DNS lookup, to roaming partners, to access points, to Radius authentication, phone settings and to SGSN configurations.

The exact cause of these problems or even the nature is usually difficult to locate. The MasterClaw Call and Session Trace application can be used to quickly find the reason why a PDP context was rejected or why the user could not attach to the network. The MasterClaw Call and Session Trace can be used to find problems related to a customer complaint or to find problems related to roamers, clients or network nodes. The MasterClaw Call and Session Trace application is easy to use and can be used by first, second and third line support. First line support may use Call and Session Trace to find out whether a subscriber is really having a problem or not, or



Benefits

- Simplifies root-cause analysis and troubleshooting GERAN and packet core network
- Provides both real-time end-to-end network visibility across access and packet core networks
- Historical tracing capabilities allow for troubleshooting during “normal business hours”, and hence reduces the cost
- Multi-user – multi-skill support allows both customer facing staff and network engineers to use the application

Features

- Supports Ga, Gb, Gc, Ge, Gf, Gn, Gi, Gp, Gr and Gs signaling interfaces
- Real-time deciphering of the Gb interface
- Seamless translation of TMSI to IMSI, P-TMSI to IMSI and IMSI to MSISDN
- Fully integrated with Anritsu’s UMTS solution

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whether it is related to his subscription or to problems in the network. Second and third line support may use MasterClaw Call and Session Trace to find the cause of the problem.

To better clarify the various features available in MasterClaw, when referring to GPRS, it is worth mentioning that the application supports any GPRS signaling protocol and can correlate several protocols together to track the full activities related to a customer. These capabilities are available both in near-real time and in historical mode. Furthermore, it can also integrate user plane statistics, provided by the optional module IP Service Troubleshooting Tools that provides:

- Integrated IP session statistics in the traditional Call and Session Trace GUI
- Advanced raw data capture features on Ethernet based Gn/Gp links

Please refer to the IP Service Troubleshooting Tool application overview and application description for further details.

GPRS Interfaces

A GPRS network consists of a numerous interfaces. Some of them are using different kind of bearer services and some are optional. The MasterClaw Call and Session Trace application supports the following GPRS interfaces: Ga, Gb, Gc, Ge, Gf, Gn, Gi, Gp, Gr and Gs. The MasterClaw deciphering option and P-TMSI to IMSI information server makes ciphering and the temporary subscriber indication of no concern to the call and session trace user. Figure 1 displays a logical view of the GPRS interfaces monitored and where Call and Session Trace is possible.

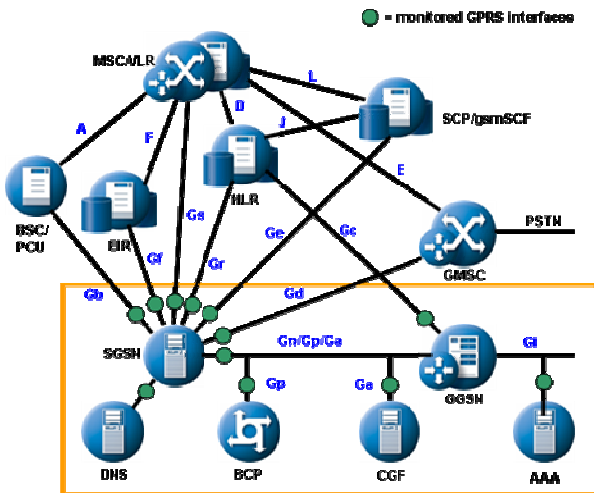


Figure 1: GPRS interfaces monitored

Scenarios

MasterClaw supports dialogue call, transaction and session trace on the various GPRS interfaces. A dialogue or procedure Call and Session Trace is a trace on one

interface e.g. Gb but on many physical and logical connections and multiple legs. A dialogue Call and Session Trace may for instance be to find all Gb Attach procedures having a certain reject cause or all "create PDP context" on the Gn interface to a certain APN and/or originated by a specific subscriber.

An example of a dialogue could be the Routing Area Update or as shown in Figure 2, a failed Attach procedure.

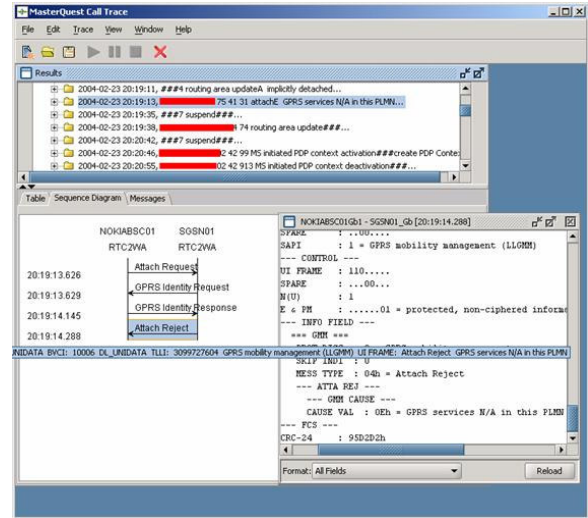


Figure 2: Simple Gb dialogue trace with failed Attach

Individual dialogues may be correlated together to form a multi-interface signaling session or call trace. An example of such a scenario is shown in Figure 3 covering the Gb and Gr interfaces.

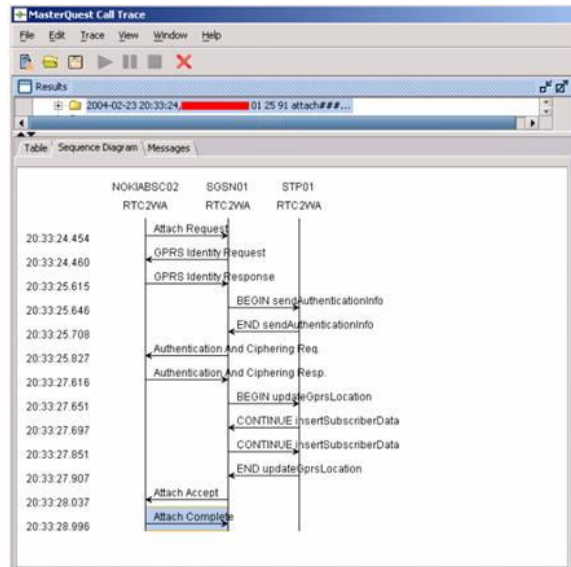


Figure 3: Example of correlated Gb and Gr scenario

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Usage of the Call and Session Trace Application

Call and Session Trace can be used by different departments with different levels of network and protocol knowledge. For a first line customer care center a simple push button system, based on few filtering options, can be used and for more advanced users a more detailed choice is possible.

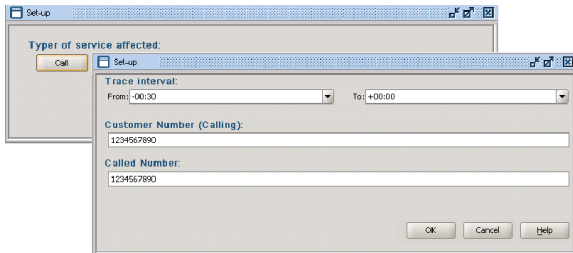


Figure 4: Example of customer care usage for tracing an ordinary ISUP call

Users with knowledge about network and protocols may desire to apply more advanced trace options as shown in Figure 5.

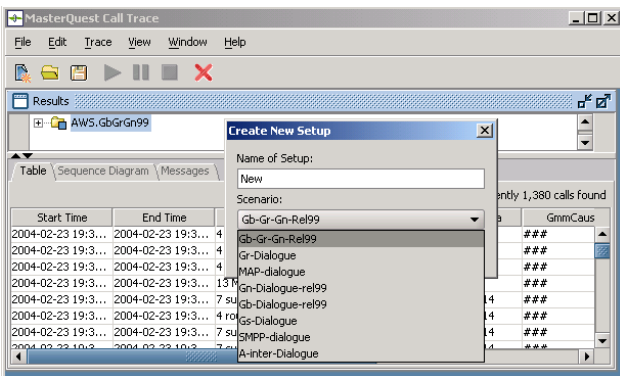


Figure 5: Available scenarios installed at a particular customer

After choosing the scenario one or more filtering selections may be applied. The filtering that is possible differs from one scenario to another. The available scenarios are all GPRS interfaces including DNS and all GSM or UMTS or VoIP interfaces including PSTN, ISDN, IN and SMS traces.

When a scenario is selected the trace can be started. In most cases however, detailed filtering choices and time intervals may be entered. Filtering is used for limiting the returned result. Filtering on IMSI for instance can be used to trace the activities of a specific subscriber or a list of subscribers like all subscribers from a specific operator or country. Other filters like Gb procedure type, APN and MSISDN are common used filters to get information on specific procedures, services or network nodes. The filters can also be used to make statistics e.g. how many PDP context failed to access a specific APN from 12:00 to 13:00 o'clock.

Depending upon the type of GPRS interface, between 30 to 100 different parameters each representing an information element is available for filtering. Many of

these parameters can be combined in OR and AND providing to the end user the complete flexibility required during detailed troubleshooting. An example of a filter applied to the Gb procedure type is shown in Figure 6.

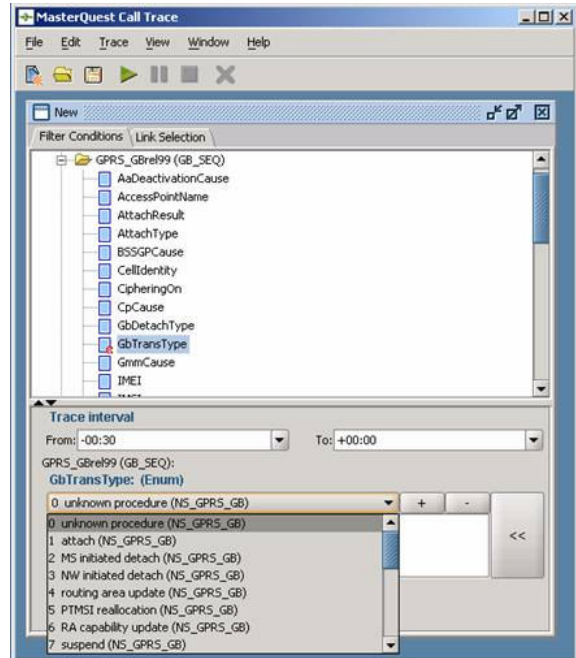


Figure 6: Example, filter on type of Gb procedures

The trace can be started by clicking the start button, after having entered the filtering options. Result appears in the result window as they are found. While the search is ongoing it is possible to examine the results that are already found. A trace may also be setup to end in the future, and may in this way be used as trigger to find specific traces like a test call.

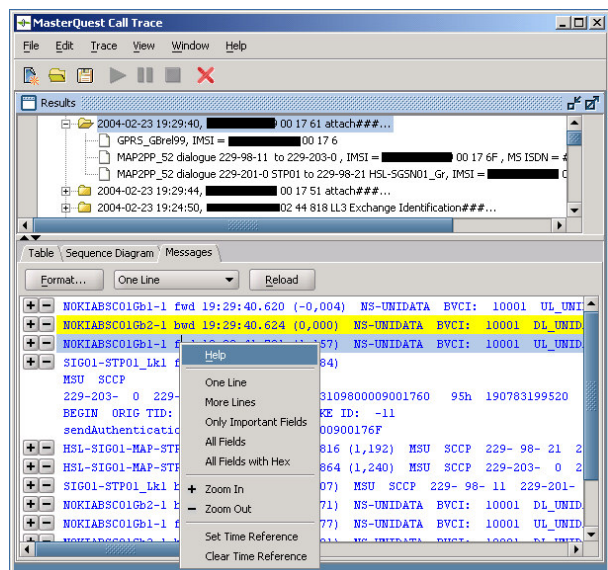


Figure 7: Example, Gb PDUs details for the found procedures

Results are presented in traces in the result window and each trace and procedure may be examined. The result of a trace may be saved for later usage, for example a customer complaint may be handled by the customer support department and the trace of the subscriber can then be passed on to the next support level that then do not need to make another trace but can immediately see the results and the filters used. Exports are available for the MasterClaw offline call trace application or in HTML, CSV, TXT/ASCII formats.

Figure 7 displays the trace result window with each dialogue found. In the figure an attach dialogue is shown that list a Gb procedure and two MAP procedures with decoding of all messages related to these procedures.

How It Works

MasterClaw Call and Session Trace is based on distributed processing power and hence it provides results very fast. In a troubleshooting situation you want to have quick response to your ad-hoc request, you simply do not want to wait for an application to decode through all the messages; you want to search on parameters already decoded. The advantage of this becomes apparent when one wants to search for subscriber activities of a specific subscriber e.g. in the last 2 hours or day.

All probes correlate the procedures and process user data and generate parameterized records that are stored locally on the probe hard disk. No back hauling of traffic or master probe is needed. The Call and Session Trace application sends a request to some or all probes with the search parameters e.g. "APN='internet' AND IMSI='123*'", The response to these request are sent to the Call and Session Trace server that may do further correlation if needed. Multiple call traces can happen simultaneously, hence not limiting this to a single user at a time.

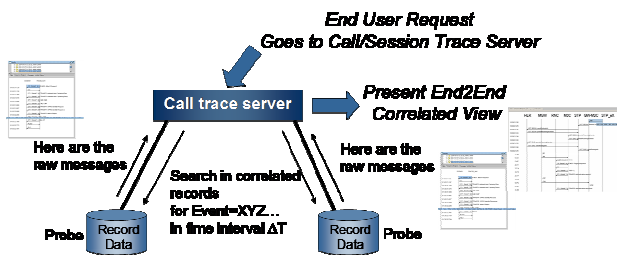


Figure 8: Probe and call and session trace server interaction

This makes Call and Session Trace very scalable and very fast. Adding more probes is not an issue because the scaling is horizontal. The records contains references to all the messages it is based on or to the IP sessions, meaning that all signaling messages and information elements can be seen if it so desired. The Call and Session Trace and probe interaction is illustrated in Figure 9: this figure shows the concept of user plane statistics included into MasterClaw Call and Session Trace. Call and Session Trace will provide the possibility to select each IP session and get further details such as volumes (bytes) as well as some information about the possible http server IP address and ports used.

Depending upon the chosen scenario the Call and Session Trace server may issue a request for data from multiple interfaces, e.g. a Gb and Gn scenario will search in both Gb signaling records and in Gn signaling records and will correlate them together in the Call and Session Trace server. If the IP Service Troubleshooting option is available also the IP session statistics are retrieved and correlated in the same identical ways providing also near real time information on the session status: in progress or completed (see Figure 9).

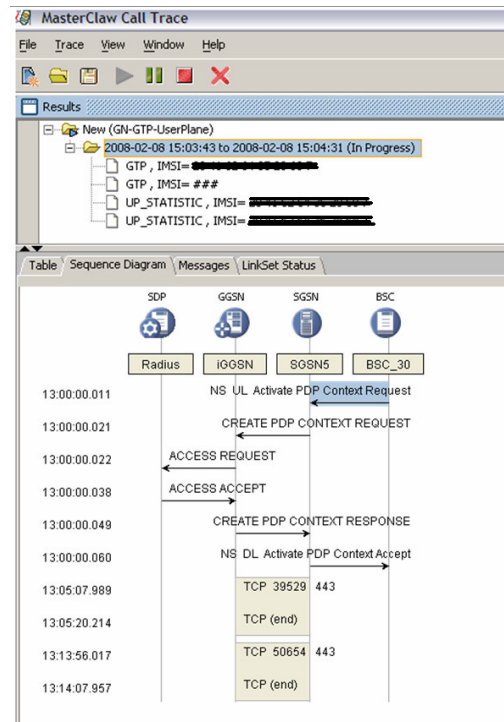


Figure 9: User plane statistics integrated into the usual signaling Call and Session Trace application

Information Servers

MasterClaw Information servers are used for enhancing Call and Session Trace usability and to assist in Gb deciphering. Information servers exist to make relation between TMSI to IMSI and P-TMSI to IMSI and IMSI to MSISDN. Figure 10 displays how information servers are deployed in GPRS networks. There may several deciphering servers, usually one per site, but there is only one global IMSI<->MSISDN server needed.

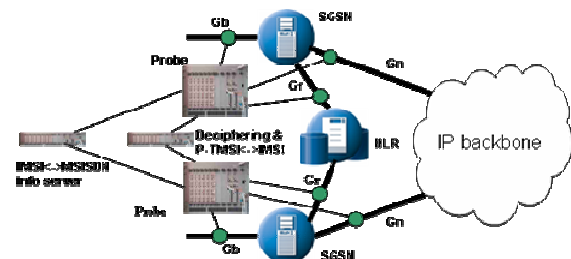


Figure 10: Information servers in GPRS

Summary

MasterClaw Call and Session Trace is a full network wide application that is both easy to use and very powerful.

MasterClaw Call and Session Trace is easy to use because it hides the complexity for the end user, e.g. the user do not have to worry about P-TMSI or TLLI but can merely enter an IMSI or MSISDN number.

The MasterClaw Call and Session Trace client may run on both Windows and Linux platforms. A call/session trace may be exported in a file for processing by the other applications or the offline version.

Combined with MasterClaw deciphering service, information servers, IP Service troubleshooting tools, link and message statistics, Protocol Analysis and key performance indicators like GPRS access KPI and IP Service KPI, MasterClaw Call and session trace is a very powerful application that can be used for fast troubleshooting in GPRS and EDGE networks.



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