

Fault Management for VoIP services

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Operating an all-round Fault Management System (FMS) is essential for the VoIP service provider to present a continuous QoS and to keep the customers happy in their area. Such a system must continuously collect and process the event notifications sent by the network elements. Being able to filter the alarming events from the reported event pool, the FMS processes these alarms and suggests a root cause for the fault as well as an action plan for its corrections. Hence the job of the maintenance personnel can greatly be simplified, however not eliminated, since their ultimate knowledge is the last hope when fighting against complex faults.

The Key Quality Indicators (KQIs) of the VoIP service depend on the errors appearing at the servicing entities, on the network itself, and on the applications providing the VoIP service. In order to correlate alarms appearing at different levels, we must provide a common interface for gathering event notifications (i.e. alarms of network elements, events being generated during call data recording) from the different type of entities listed above. Since any given alarm notification – i.e. application server not reachable – can be registered in several different places by various methods, finding the ultimate root cause from these redundant data is certainly a challenging task.

We can eliminate the occurrence of “alarm-notification flooding” by applying appropriate alarm filters. The alarm notifications arriving to the system can be conditionally/temporarily suppressed, counted or prioritised. Having them stored in a database we are able to carry out further operations on them. Setting up correlating rules between them allows us to gather many smaller alarm notifications under the umbrella of a verbose, but single “summarising” alarm notification. The job of a human operator becomes simplified if the system only shows these kinds of alarms instead of many unconnected ones. Having a certain “knowledge” about the state of the entities, trend-analysis methods allow us to predict certain type of errors. A periodical pattern-matching algorithm can search the database, and suggest severe errors possibly happening in the future.

Applying filter-, correlating- and trend-analysis rules are not always enough to find the ultimate root cause. The FMS should initiate a Root Cause Analysis (RCA) procedure for the given alarm notification. During the RCA it is possible to check upon the state and configuration of the various managed objects by starting active test procedures. After processing the RCA result, the FMS makes a suggestion for the nature of the root cause, the possible position of the failure and the correcting actions. There are not many methods available in the literature for sequencing and evaluating the elemental checks. During the IKTA-00092-2002 project (founded by the Ministry of Education, Hungary, supported by NIIFI) we have developed a unique, Petri-based method. Its advantage is that the RCA evaluation is data-driven (checks can be initiated and evaluated concurrently), hence the whole procedure gets simpler to plan and faster to execute. We have evaluated the call data record (CDR) notifications over some anonymous data captured from NIIFI’s VoIP network.

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