Framework on Economical Implication and Issues of SADU Implementation

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Abstract: Due to software which plays an increasingly role in everyday life, interaction between humans and computers will increase in importance; therefore, the ability to support interactions for efficient re-use of experience is a major challenge for systems in the future. Trace Based Reasoning will have a significant impact on applications sharing experience, when they are based on the web in particular, since traces allow us to imagine several ways of interaction in systems and to combine multiple modes of interaction in a single system. In the conducted study we aimed at developing an Assist System of Human Diagnostician (SADU), meaning that this system will have the human knowledge and then information retrieved by interaction with humans at the SADU request.

Keywords: SADU; Case Based Reasoning; Trace Based Reasoning; diagnosis; intelligent agent

JEL Classification: C8

1 Introduction

Presenting and exploiting redundancy episodes from different levels of virtualization (virtualization layers, physical machine, administrating mechanisms for system engineer or human diagnostician in order to identify, discuss and illustrate specific episodes and content on levels of abstraction)represent the key point of the study.

Presenting and exploiting the episodes "serialization" as events that occur or are sequentially collected from the sub-systems used in virtualized system operation provide over time the sequence of messages that, in turn, offers valuable redundant information for refining diagnosis.

These episodes are enriched with information taken from predetermined moments (context) with numerical values (from sensors and performance or capacity

parameters of the resources) and qualitative values of human diagnostician (taken or measured at the man's initiative).

The sequence of events taken and supplemented with information from sensors and from the human diagnostician (all default serialized by virtualized system or through collecting information by SADU from sensors / person) –stands for "signatures" or "traces" that will be used in diagnosis.

Signatures (sequences) will be partly or wholly used (e.g. the emergence of a key event is expected to end the "chain" of event or the ongoing chain processes) thus being sufficient to implement the diagnosis.

Also, the knowledge acquisition regarding the inappropriate behavior of intelligent systems is a systematic process, firstly, that of presenting the processes, procedures and stages that occur, and secondly that of a proposed acquisition of knowledge and insight of the system. A good knowledge of the system with all its features is a decisive factor for the successful acquisition of knowledge. In addition, for accomplishing a fault diagnosis, knowledge and knowledge acquisition are necessary for the fault behavior (faults / symptoms and manifestations, defects granularity, relations between them in various contexts of operation).

Creating traces context and all the necessary tools and knowledge acquisition are things that will be made available to all staff, aiming to unify, update and validate them, and leading to a diagnosis of defects. The methods used for the acquisition of knowledge will focus on the classical knowledge acquisition from a human expert, and automatic knowledge acquisition method using intelligent agents, we will subsequently provide a community to offer experts for discussion and validation casuistry, which today is not unified, made public - there are just as tacit knowledge - or missing altogether.

2 The Approach

Trace activity context are stored in a database, similar with CBR database, which contains all necessary information about the involved events in a lot of applications, logical relationships between this information and appropriate processing techniques.

Database (DB) is a collection of many and different types of occurrences of logical records containing relationships between aggregated data records and basic data.

Database management system (DBMS) is a set of programs for the creation, maintenance and operation of the database.

As previously mentioned, the cases which indicate the failure are inserted into the database by intelligent agents characterized by their skills, according to the layer in which they are raised.

Initially, cases were inserted manually by the human agent because they occurred before or with the development of intelligent agents. Solutions for solving the initial cases are also provided by the human agent until a measure of trust granted to the intelligent agent. Subsequently, after inserting into the database by the intelligent agents of events signifies a malfunction or appearance of a new fault, human agent, based on similarity, search for a solution to the problem emerged again. If it exists, the found solution is adapted to the new case along with the rating, and if it does not exist, based on past experiences try solving the case.. If instead we do not have a solution for the new event, the issue is left to community debate.

If new fault occurs, a possible solution is adapted based on similarity and also if the candidate solution leads to events elimination, therefore of the fault, the solution rating increase simultaneous with the certain confidence degree granted to the intelligent agent, so that next time it encounters the same error the human operator intervention will not be necessary.

Currently, when an event occurs, intelligent agent inserts a new record in the database, indicating that a new case emerged along with assessing the degree of functionality of the system. The human agent intervenes and inserts the manner of case solving if there is no candidate solution. If deems it necessary to be granted a certain degree of confidence in solving the same intelligent agents problem, the human agent does so that in case of a new similar case emergence, the intelligent agent added to the database a new record and comparing it with the previous case based on similarity between cases, running the script that led to the best solution. It is possible to have several solutions for a past case with the same error but the decision of human agent is crucial for the beginning in choosing the best solution followed by the granting of its rating. Of course there is the possibility it could fail, but in time, the intelligent agent will improve through self-directed learning, which will lead to fewer human errors.

2.1 DBMS Architecture and Operation

The program – resort to DBMS, indicating the name of the program of data type and value of required registration key

DBMS

- Obtains a subschema used by external program and examines the data description;
- Obtains the scheme and determines the logic type of necessary data;
- Examines the physical description of the database and determine the necessary physical record;
- Sends a command towards the operating system (OS), demanding reading the physical record;

Operating System (OS)

- Interacts with the data storage devices
- Transfers the requested data from the device in the buffer zones of the OS

DBMS

- Deduces through the necessary and logical subschema and eventually, transforms the data
- Transfers the data from buffer zones in the working area of the program
- Provides to the program the storage information on the operation (eventually indicates the error)

The program – operates on data in its working area

Entity – Relationship Model is the graphical way of representing the data and relations between them, by entities, relations and attributes, described in detail.

A relational database model has three main components:

- *Data Structure* by defining some *domains*(atomic values) and of *relationship* "n" (attributes, tuples, primary keys);
- *Data integration* by imposing restrictions;
- *Data processing* through operations from the relational algebra or relational computing

The Entity – Relationship Model is presented in Figure 1.

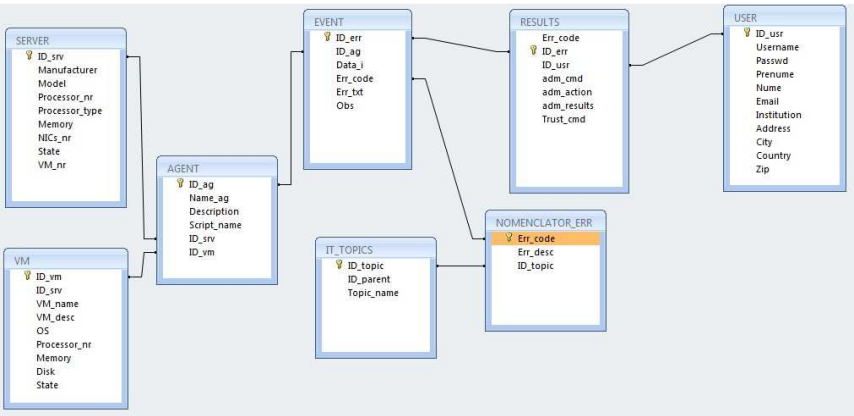


Figure 2. Tables relationship

2.2 Graphical User Interface

The interfaces allow access to the information of a database and a simple definition of applications, which enable the use of database and users. The interfaces include data access components, data presentation components, components of generating some applications and other features such as opportunities to use statistical methods, word processing, spreadsheet work programs, cores of expert systems, etc.

At these there can be added different possibilities of testing, simulation, of information processing (copying, sorting, merging, etc.), automatic design, multimedia and other work opportunities. The graphical interface of the diagnosis site is made with the help of PHP language and the database by using DBMS MySOL.

The main page shows us an overview of the entities that make the subject of the diagnosis. Here we find information on agents, at abstracted physical servers, virtual machines, events and categories of these – areas of interest (Figure 2).

Figure 3. The access main page

Using the interface we can display, insert, update and delete agents, abstracted physical servers, virtual machines, events and areas of interest (Figure 3 – Figure 7).

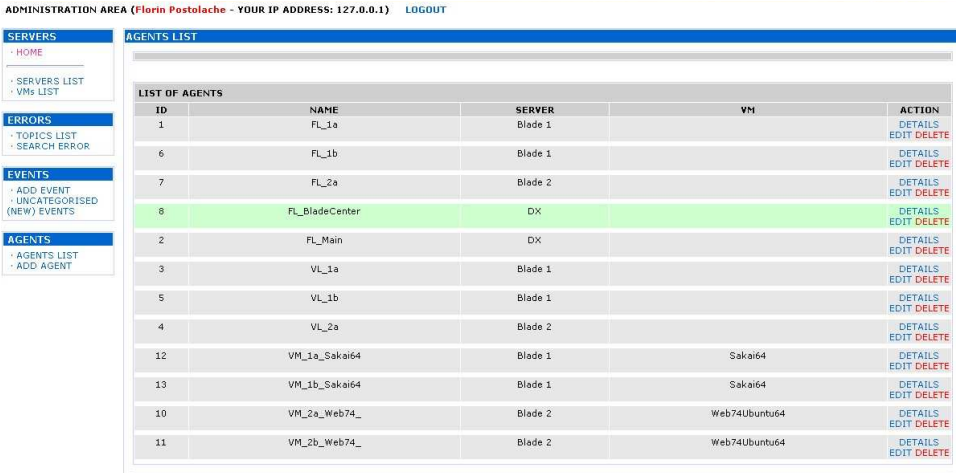


Figure 4. Listing Agents

Figure 3. Listing abstracted physical machines (servers)

Figure 5. Listing virtual machines

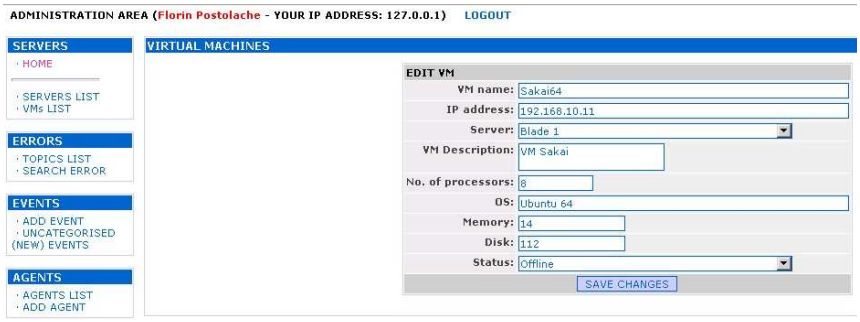


Figure 6. Editing virtual machine

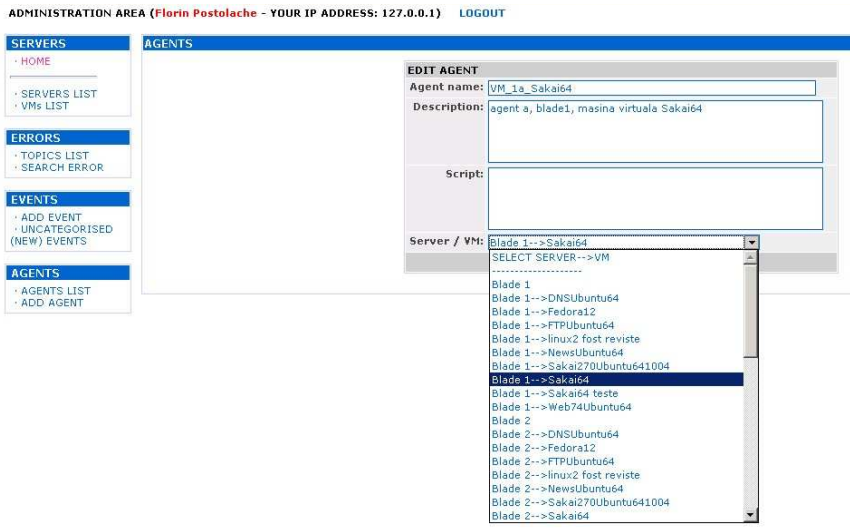


Figure 7. Agent editing

2.3 Insert New Record in Database

The insertion into the database of a new case is made automatically by the agent but can be made and by the human agent, whether it is about adding events, abstracted serves, virtual machines or new users.

Thus the insertion of new occurred error is made automatically by the intelligent agent. Also, the human agent has an interface with which it can insert new cases, as is shown in the figure below.

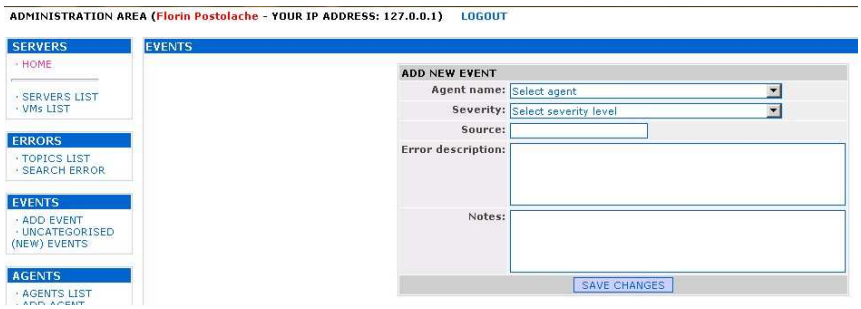


Figure 8. Adding event

2.4 The Consultation of Trace Activity Context

Consultation the context activity trace (database) is made by interrogating the events or cases after keywords (Figure 10.). The intelligent agents insert new events which the human agent find them in the list of events without category (Figure 9), and after the insertion of the possible solution, the event subscribes at the field of interest, in other words it is attached to a category – area of interest (Figure 13). Here we can observe how many time we have faced with the same error and what were the possible solutions given, but and which solution was considered the best by granting the highest rating.

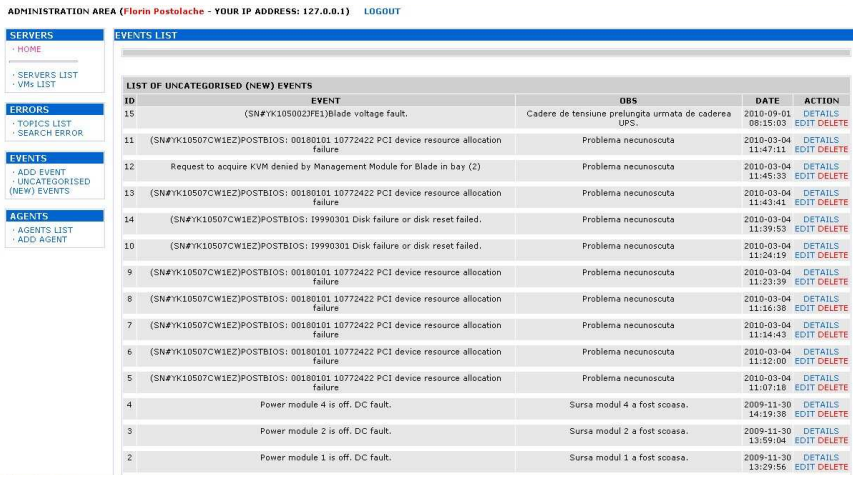


Figure 9. List of unresolved events

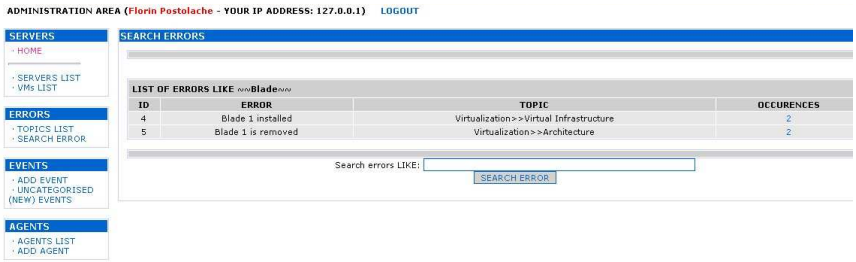


Figure 10. Search after keywords

2.5 Solving the Cases by the Human Agent and Providing Trust to the Agent

In resolving cases by the human agent and the eventual trust granted to the intelligent agent we have the next steps to follow.

In the list of unresolved events (and that does not belong to a domain of interest), it is selected the event that is wished to be resolved. In this moment are displayed the information about the agent who inserted it in the database and the location where it occurred. In the figure below is observed that the event was inserted by the appropriate agent of the physical layer (FL), and the name of the agent is FL_Blade Center. It is also observed the physical characteristics of the server were we have placed the agent (Figure 11). If the agent was placed on a virtual machines, there were displayed and the information about the virtual machine.

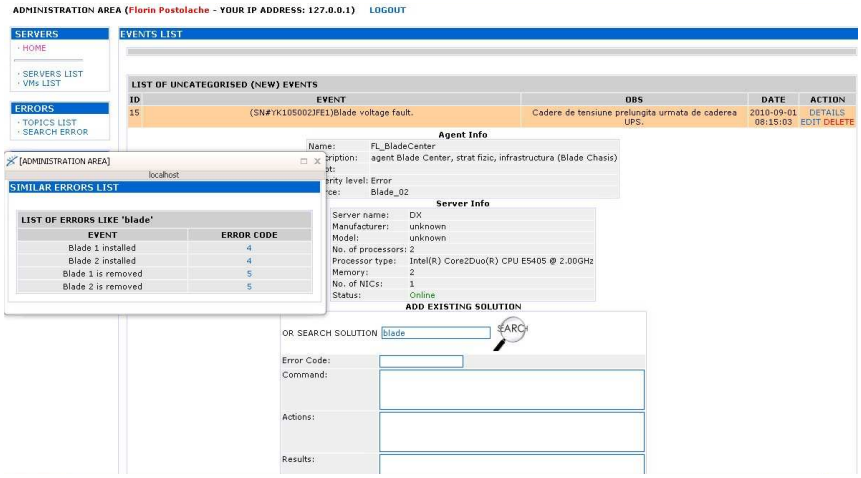
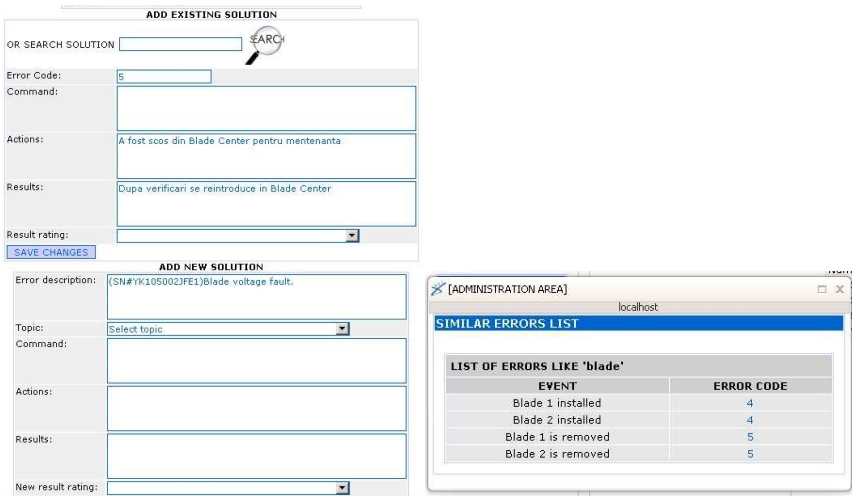


Figure 11. Event resolving

If this error has been encountered in a previous case, it is observed in the area ADD EXISTING SOLUTION action and result had after the action. (Figure 12a). If instead we are dealing with an event that never took place, we can have the most appropriate solution according to the similarity between cases. If it appears that we have a similar case it is selected after the error code, and after this action, the result of the previous solution is passed as a possible solution for the new case (Figure 12b). We can also, grant trust to the intelligent agent having as result the automatic solving of a similar error.



a) b)

Figure 12. Edit existing solution and adding of new solution according to the similarity of cases

3 Fields of Interest

In Figure 13 are structured the fields of interest according to the levels that we have within the system subject to testing

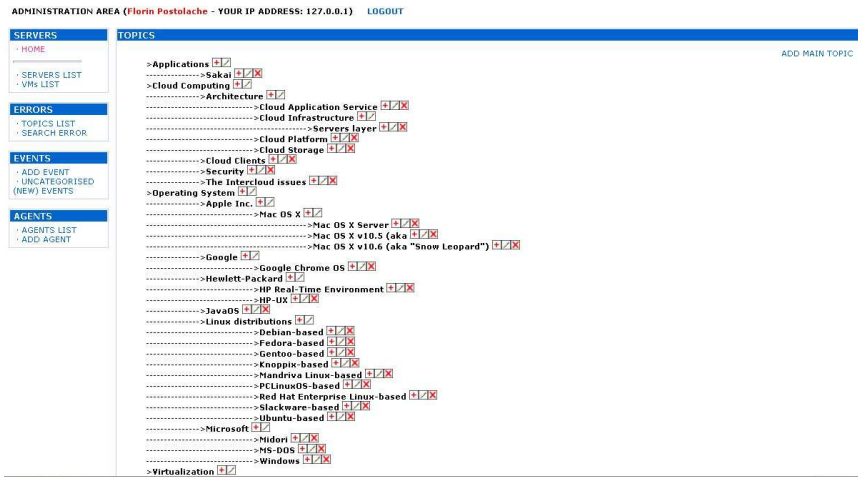


Figure 13. Fields of interest

4 Conclusions and Contributions

Due to the current economic climate and of the problems imposed by the security of informatics systems, the companies have now begun to use the virtualization technologies to protect better the most valuable assets: data stored. Decreasing the costs involved by the investments in hardware, software and by granting licenses as well as and the reduction of utility bills, minimize the downtime of equipments and simplification and streamlining the management processes are objectives of which we can benefit through virtualization. Once with the growth and development of the company, the needs grow and change. Of course we always hit with problems and new obstacles, so we have to consider that is possible that an application that today we virtualized – such as an SQL database – may have to be moved back to a physical environment, as a result of the growth of database or need of more computing power or due to some priority processes. We must analyze in detail with what instruments we operate for the migration of machineries and applications at a virtual environment, ensuring that the selection was corrected in the case in which we pass back to a physical server or we migrate the application on different installed virtual machines on different hardware machines.

When it is resorted to virtualization, configuration and implementation in the centers of data of the company offer a range of benefits concerning the costs and energy conservation. However the organizations can decide sometimes with difficulty the involvement in a virtualization project, without assessing the way in which such a project will have an impact on traditional operations, both from technical and organizationally point of view. In addition, the companies must ensure that the capacity planning and monitoring tools are the necessary ones and able to asses within a virtualized environment the operation and performance of the application.

While the planning and configuration process concerning the virtualization can be viewed as a challenge, the advantages of application migration can be significant. The administrative rights will have to be reviewed, together with the roles and responsibilities, being responsible to act in a new scenario when one or two applications require access to a number of physical machines or require additional storage space. Hence, it can be computed the relation between software and hardware taking into account and by some reserve cycles to sustain a possible failure of the machine so that in time the project to give value to organization. The security strategy of the data center must take into account both the physical devices and of the virtual devices.

We recall that the hypervisor software and selected firmware plays a key role in virtualization and maintaining contact with the supplier of virtualization services (based on the analysis, services and project that they propose) is essential to determine the level of risk and of protection necessary to hypervisor. The virtualization also has an impact on the physical infrastructure due to the computing power necessary to physical devices that support multiple virtual machines, as well as and a certain capacity of the network to satisfy the requests of transfer between the virtual and physical machines. The virtualization has proven to be an effective mean of consolidation of hardware resources but is still limited by the non critical areas of operations from the Data Center. This means that man companies take initiative to strengthen the efforts: technology is there to continue the process, but the decrease of performances is sometimes too large to justify the reduction in costs. Here is about the installation on virtual machines of the operating system Windows, Linux, MacOS. But this reason is about to change, because a new generation of technologies improves both the speed and the performance of the critical applications and the ability to manage them.

These are the multitude of considerations, and it is essential that the project to be well planned and all the possible costs and complications that can appear to be take into the calculation of the project.

Recognizing these benefits of the virtualization previously listed and aiming the purpose of putting the base of a trained system which to support the decisions of human diagnostician after solving the appeared problems, modern complex IT systems lead at challenges for system engineers in understanding and troubleshoot the possible problems that may occur in throughout the operation, but especially in tracking the manifestations on each level that enters into the component of the target system, to locate and remedy the defect according to the supplementary hypotheses and investigations.

However, there is no single technique, that to be considered the best, in terms of accuracy, complexity, performance and adaptation at changes having as purpose solving the general problems in diagnosing the defects. Also, to develop a better solution (Katker & Paterok, 1997) many researchers try to combine different techniques.

In general the approaches based on rules can be used for a simple system, which is rarely changed when the systems based on model present a supplementary model of the system concerning the rules, which makes them superior to the systems

based on rules but does not make them more attractive because of obtaining and updating the model with difficulty. Although the systems based on cases are less sensitive to changes from system, these are not suited to manipulate in real time the correlation of the alarm. The most accessible idea found behind many localization techniques of defects is considered the correspondence alarm/ event dye to higher capacity to restore relations between alarms/events.

Thus, as in the case (Bocaniala, 2005) the complex system will be divided into levels of interests (subsystems) where some techniques presented above can be applied successfully. The global diagnosis of the complex system will be obtained in the base of subsystems diagnoses.

Also, changing the model from a orientation focused on fault to one based on traces to facilitate or amplify the own capacities of different human experts or user is the strength in diagnosis of virtualized systems due to modeling the interactions between the physical and virtual resources. The fact that we overrate the available physical resources, we allow better equilibrations of the needs that ot can have an application at a time.

The major advantage comes from the fact that the diagnosis system is functional from the first time, without requiring the entire inserted casuistry related by the context activity of trace, because this is completed during the development of processes, and in the case of occurring unknown faults, without immediate solution, the problem is left in discussion/ analysis for resolving the community of specialists from the domain. However it is necessary a structure of the domain well prepared, in order not to face major problems during the development of the diagnostic system.

Knowledge of weight of influence of a “situation” in global functioning of the system is another very important goal. Deepening on the degree obtained from the system at $t_1$moment an the degree given at the $t_2$moment of the fault, results the share that it has the fault in appreciation/ depreciation of functional state of the system.

A final goal achieved is the characterization of the global stat of the system that occurs in punctual allocation of the resources by a critical factor (resource allocation for a car that has a critical need for resources) due to:

- Situation (status of fault – networking, client, background services;
- Components (processor, RAM, HDD);

- Constraints I/O;
- Resources sharing

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