Integrated System Monitoring and Recovering Tool for T-24 Core Banking Applications in Ethiopia

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Abstract

While application systems are becoming complex in organizations, it is vital to control and monitor system operations. This helps to increase system availability. The availability of core banking applications has to be reliable to increase customer satisfaction. In effect, managing data centers is getting attention. Administrators use a number of technologies to proactively monitor data centers. Existing monitoring tools help to monitor applications, networks and databases. The existing tools mainly focus to monitor and detect system failure and report to the administrators for corrective action. But, some problems can be fixed without administrators' intervention. This greatly benefits businesses since their business applications can continue working during office off-hours where the administrators are not present in person. Therefore, system monitoring and recovering tools are preferable if they are capable to automatically detect failures and take corrective actions. Five banks in Ethiopia have implemented the T24 core banking solution. They are using different monitoring tools for each tier of the core banking solution architecture in the data center. Due to different types of monitoring tools whenever a problem occurs it is very difficult to see where exactly is the problem, which may take a long time to understand and recover from the problem.

Towards this, an empirical study was conducted at the five banks where the T24/Temenos product is implemented. Data was collected using structured interview questions from these five banks. IT experts from each area were involved. The architecture of T24 has been studied thoroughly. Hence, it is understood that some of the problems identified can be fixed automatically.

Consequently, an integrated monitoring and recovery application was designed and implemented so that each layer service can be displayed on one interface where the IT experts can easily monitor and observe where the problem occurred effortlessly. Test results have shown the validity of the tool and the scripts used to detect and fix errors automatically.

Keywords: Data Center; Core Banking Application; Integrated Monitoring Tool; Recovery Tool

1. Introduction

The technology advancement in the world is pacing dynamically and very fast. Industries, universities, government and private institutions and the people are using the technology in a foot step with the change of the technology that makes the provider and the user to become very dependent on the technology.

To enable the functionality of the technology, Ethiopia is in a state of adopting and customizing the emerging technology to the country's context. In effect, ethio telecom provides services like mobile, Internet, data and others using its Multi Protocol Label Switching (MPLS) network.

Out of all the services, the data service is highly consumed by the banking industry as banks are using the technology by automating their internal activities. Customers should subscribe to use bank products through the services/channels like Inter branch, Automated Teller Machine (ATM), Point of Sale

(PoS), Mobile Money & Internet Banking, Agent banking and Short Message Service (SMS). Since customers count is increasing from time to time, the banks are demanding to use high end processing machines at the data centers to host service applications and user requests concurrently. A request packet for any kind of transaction passes over the network, i.e., Wide Area Network (WAN), the bank's Virtual Private Network (VPN) or Switching VPN in the Internet Service Provider (ISP), Local Area Network (LAN) of the Bank (Demilitarized zone, very secured Server farm zone) then the reply will follow the same path.

All these touching points have to be active for accomplishing a customers' request. Inevitably, real systems may interrupt as a result of failure of Network (WAN, LAN), Server, Database, execution of Application, Administrators' misconfiguration or system misuse by users. A repeatedly unavailable application system will bring on boarding customer dissatisfaction that will cause customer attrition and loss of income. To reduce cut off service time, banks are hiring experts in all areas of the Information Technology services like Networking, Database and application to manage the system supported by monitoring tools which can report every operation on the environment including the failures that help the administrators act according to the report log.

2. Related Work

We tried to scrutinize different integrated monitoring tools. However, eG Enterprise and AccelOps are two selected tools based on the goal of the research.

2.1 eG Enterprise

eG Enterprise is a comprehensive new generation monitoring console that effectively delivers integrated monitoring and management services for the core banking solution and its extended infrastructure. Providing a holistic single pane of glass view of the core banking infrastructure from a business service perspective, it empowers banks to proactively monitor and analyze health parameters, including: Service availability, Service Response Time, Core Banking Software status, Status of Critical Processes, Network status, Operating System health, Web server Performance, Application server status and usage, Database health, Application logs and configuration, Network usage and response.

eG Enterprise enables banks to monitor critical health parameters, with little intervention from the individual software and hardware vendors, thereby greatly improving diagnostics, issue detection and resolution. The solution assists in root cause analysis of issues, establishes health parameter correlations and monitors error log files and configuration changes. This proves invaluable for the banks infrastructure team to ensure 100% service uptime. It helps administrators configure and manage services effectively, while also supporting effective troubleshooting. Instant SMS and e-mail alerts, along with the solutions custom-configurable performance dashboards enable managers to analyze trends and make timely and effective decisions. Optimal application administration, efficient upgrade planning, reduced maintenance costs and improved customer service are the welcome outcomes [1].

The key capabilities of eG enterprise monitoring solution are Extensible Framework, Agent and Agent-less Monitoring Options, Performance Analysis and Reporting, Automated Diagnosis, End-to-End Service Views, Error Log Monitoring, Configuration Monitoring, and Alerts. Moreover, it has the following business benefits: Improved Productivity, Increased up time and Improved Customer Service [3].

2.2 AccelOps

An integrated data center monitoring solution is designed and applied at Chicago State University to improve efficiency and responsiveness. The ideal monitoring solution provides comprehensive, real-time data to integrate information from a variety of different systems into a single pane of glass and encourages holistic data center management processes. Data may be extracted in inconsistent manners, or even pulled from external systems, but

monitoring provides accurate, real-time data and reporting to allow all audiences to proactively respond to critical issues including system administrators, executives, line of business managers, partners and customers which can save millions of dollars in potential lost revenue. For example, the Data Center Journal reports the cost of downtime continues to climb, with some industries approaching $3 million per hour in lost revenue due to issues related to downtime [4].

2.3 Features Taken to this Research

The monitoring tools discussed above are evaluated against the three factors for the development of integrated monitoring tools already described before. Hence, both tools are cost effective, operationally simple for administrators and have single pane for viewing all monitored areas. Both have the feature to automatically analyze and log the problems which are going to be fixed by the administrators by letting them to know the problem happened by SMS or e-mail. In this research, core features monitoring are adopted and new features are added to recover the system automatically after the problem has been analyzed.

3. The Proposed Solution

The proposed solution has a capability of monitoring and recovering system errors in an integrated fashion. For this purpose, potential problems from each layer of the T-24 architecture that can be fixed automatically are analyzed.

3.1 Architecture

The proposed integrated monitoring and recovering tool architecture is shown in Figure 1. It has the following components.

Dashboard: it is a web based user interface that enables to view the whole system status and administrators can follow up the servers' condition and maintain all the required configuration.

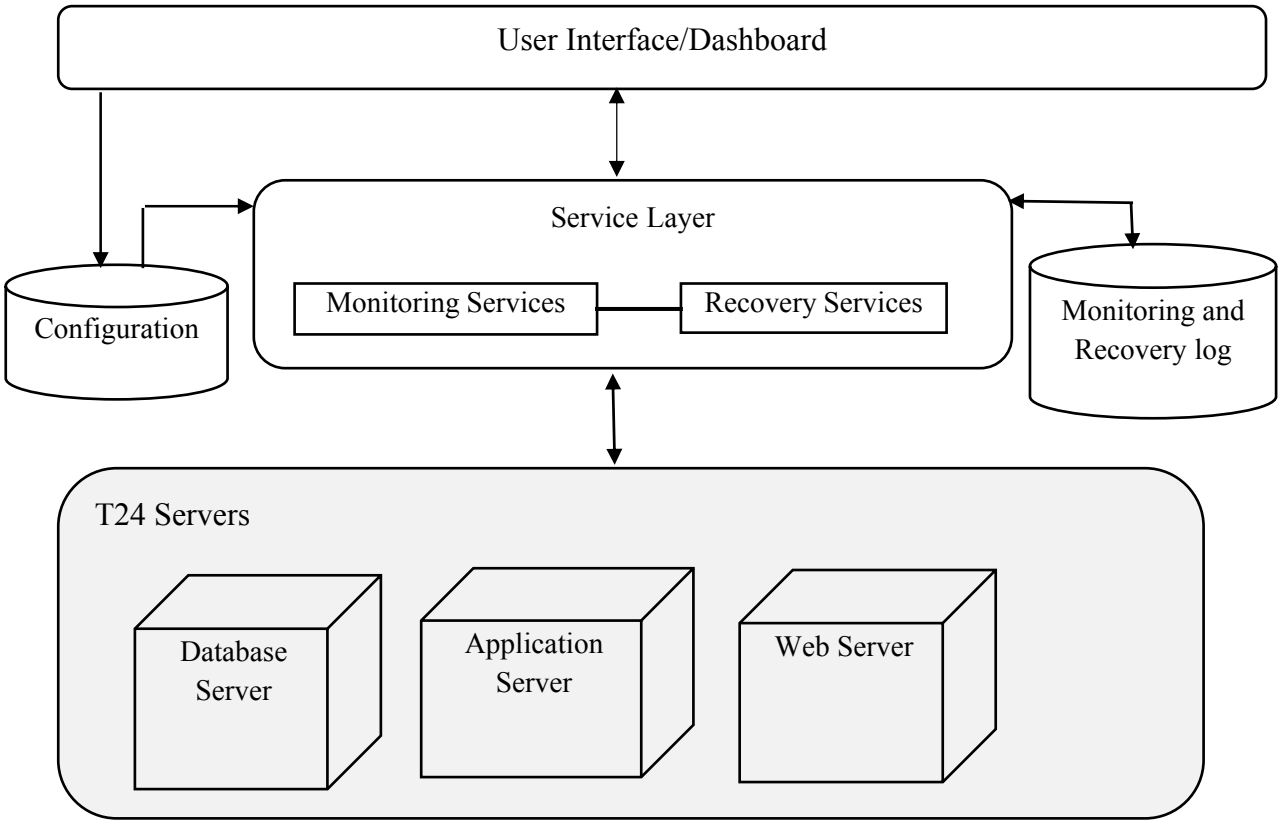


Figure 1: Integrated Monitoring Tool Architecture

Service Layer: it is a layer that consists of monitoring and recovering services. All the required background scripts are developed to monitor and push automatic fix to the problem occurred with its log for every task that has been done. The log files from the scripts are pushed to one folder where integration could occur so that the interface is able to read and present to the viewer [2].

Creation of Monitor directory where integration applied is created in the T24 directory so that it can hold every layer log status. This folder has the read, write and execute access to its user, group and others' access rights. This directory should also be shared to be accessed from Windows clients where monitoring interface could read and display the status from the log files. Integrated monitoring is to explore the ways of linking and enhance various sources and technologies in order to provide a more integrated approach in monitoring the data center [5].

The tool displays those logged information from the integration folder. The scripts which are running in the background can monitor and fix if the problem happened and logged those information to the integration folder where the interface can read and display it to the users.

3.2 Implementation of the Solution

Using the data collected the problems are categorized as those which can be fixed using automation and those that need all the time administrators' intervention. By analyzing the status of the problem against the modular data center normal operation a script shell program helps to monitor that particular fault operation and push for automatic fix.

The implementation server used in this research is Windows Server where the integrated monitoring interface can read a file from the monitored directory of Linux shared with Samba server to Windows. Apache server is installed and how to read files, display and refresh pages every 5 seconds are programmed. Java Server Pages (JSP), which is hosted on apache tomcat, is used to show the status of the Network, Web Application and Database application. The Monitor directory should also be shared to be accessed from Windows clients where monitoring interface could read and display the status from the log files.

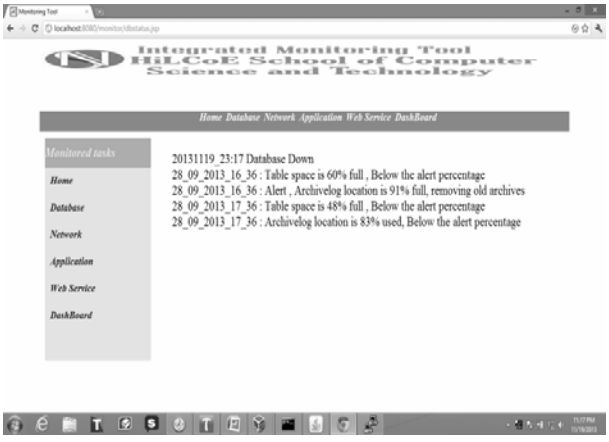
As a scenario we can see the following paragraph on how the database monitoring and recovering script is written. As an example the TC service status checking script is written in the following way.

```
#!/bin/bash
while [true] ; do
n=`ps -ef | grep tcserver.jar | grepDjava | grep lib | wc -l`
if [$n -lt 1] then
    now=`date +%Y%m%d:%H:%M`
    echo "$now : TC Server is Down"
    sleep 30
    n=`ps -ef | grep tcserver.jar | grepDjava | grep lib | wc -l`
if [$n -lt 1] then
    now=`date +%Y%m%d:%H:%M`
    echo "$now : Starting TCServer"
    cd /t24/t24test/TCS/bin
    sh TCServer.sh > tcstart.log
else
    now=`date +%Y%m%d:%H:%M`
    echo "$now : TCServer started Manually"
    fi
    fi
    sleep 60
done
```

3.4 Sample Screenshots on the Database Automatic Fix

The screenshots in Figure 2 show the process when the database is down and as it is displayed by the interface.

(a) Before the database is down



(b) When the database is down

(c) when the database is started successfully (20131119_23:18 in the screen shot above)

Figure 2: Sample Screen Shots

For the implementation of the Scripts the proper working conditions of each problem are studied, analyzed and keywords of the normal case are extracted. Hence the scripts are programmed based on if---else conditions where if the keyword is there the proper working condition fulfills then it will report with the time stamp that it is UP or working but if it is not responding or misses the keyword of the normal working condition then either it is Down or not working. To make it continuously working to monitor as such the process runs as a background.

Testing is conducted to check availability and integrity of servers. The results have proven the possibility of detecting and recovering some of the failure problems.

In general, the study is worthy because of:

- Integration of bank monitoring processing can get most quickly to availability goal,
- Better product analysis and monitoring,
- Bank can quickly respond to market scenario and customer needs. This gives competitive edge to the bank.
- Software applications such as database, either on-site or off-site, can be easily repaired.

4. Conclusion and Future Work

In the last few years, banks in Ethiopia have started implementing core banking solutions for their core services. T24 is one of the core banking applications implemented at five banks. Due to the centralized structure and other system settings, the banking services interrupt due to system failure. Though they attempt to implement monitoring tools for different aspects of the system, they are not well integrated and provided by different vendors. Furthermore, though some problems can potentially be recovered automatically, the existing monitoring tools do not do that. This research basically attempted to address these problems.

Based on the data collected, problems were analyzed and a tool was designed and developed to solve the problems partly without experts' intervention. The proposed integrated monitoring tool is designed and implemented to display all the tiers status in one dashboard. This improves system availability and in consequence the banking service provision shall improve.

For the purpose of testing, the T24 application with all the database and web application services

were installed and configured on one machine. Testing scenarios were used to test the integrated monitoring and recovering tool on which it works successfully.

Ethiopian banks currently rely on multiple systems with different monitoring mechanisms in a single data center for core banking system infrastructure which delay the uptime of system failure since information became hidden. It is essential for banks to leverage integrated monitoring and recovery tool to properly administer and allocate resources which can enhance the availability of the core banking application that will satisfy the bank's customers, stakeholders and will make also the bank profitable.

As a future work, this delivered product can be commercial by adding some works like integrated with GSM Modem to SMS to the concerned body whenever problem happens, change management tracing mechanisms to know who did configuration changes and display information before the problem will arise. And also the efficiency of the script and the interface can be studied and modified as per the measured values in terms of processor, memory and storage used.

As a future work, this delivered product can be commercial by adding some works like integrated with GSM Modem to SMS to the concerned body whenever problem happens, change management tracing mechanisms to know who did configuration changes and display information before the problem will arise. And also the efficiency of the script and the interface can be studied and modified as per the measured values in terms of processor, memory and storage used.

References

[1] C. Wang, K. Schwan, V. Talwar, G. Eisenhauer, L. Hu, and M. Wolf, "A Flexible Architecture Integrating Monitoring and Analytics For Managing Large-Scale Data Centers," In Proceedings of the 8th ACM International Conference on Autonomic Computing - ICAC '11, No. 1, pp. 141, 2011.

[2] T. Challenge, "Application Monitoring."

[3] "eG_for_Banking", End to End monitoring for CBI.

[4] B. Ce and C. Dillon, "Transforming IT with Integrated Monitoring", 2011.

[5] S. Data, "Data Center Infrastructure Management (DCIM) Software", pp. 1–12.