End-to-end Service Level Monitoring with Synthetic Transactions

What are Synthetic Transactions? Why are they useful? How can they be paramount for Service Level Management projects? What characteristics should they have?
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Simulated or “synthetic” transactions are usually the best way to monitor response time and availability of critical business services. By using them, service levels can be achieved and controlled comprehensively, easily, and efficiently. Synthetic transactions are also valuable for security vulnerability testing, KPI retrieval, and alignment between the IT department and corporate goals.

This white paper describes why synthetic transactions are popular, the desired characteristics of a good synthetic transaction engine and the Tango/04 extensions around this technology designed to increase the value of your monitoring projects.
Monitoring Transactions: the Basics

The Need

Corporate productivity demands are ever increasing and either driven by formal contracts such as Service Level Agreements (SLA’s) or informal mandates dictated by executive management. It is obvious that productivity increases render increased profits and competitive advantages. To satisfy productivity requirements, there is clearly a need to measure (and improve if necessary) the end user experience as they access your critical business applications. The quality of IT services has an enormous weight on the quality of the business services they support, not only for online banking and web stores but for practically any customer-facing application.

Companies typically devote time and money to monitor infrastructure elements. Unfortunately, monitoring individual components alone is usually not enough to determine whether applications are working as expected. This is the case even if you are monitoring thousands of components and technical metrics.

As your applications grow in complexity, either synthetic or real transactions\(^1\) can be used to assess end-to-end application availability and user response times.

What Are Synthetic Transactions?

“Synthetic transaction” is a common technical term used to refer to operations that are artificially executed in an application with the purpose of measuring end user experience. They are called “synthetic” (artificial, mock, fake) as opposed to the “real”, genuine transactions the end users are generating.

A synthetic transaction is no more than a series of keystrokes or mouse movements recorded and replayed periodically to simulate the existence of a real user. To the application, it simply looks like another end user.

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\(^1\) An example of a “transaction” would be all the required steps to introduce a new customer in an ERP system, to check a customer account on a banking application, or retrieving the customer history in the CRM system, using either desktop or web interfaces.
The Problem with End User Experience Measurement

The use of synthetic transactions has gained popularity because measuring real transactions can be:

- **Difficult**: some systems are not prepared to monitor user usage, so the logs are scarce or nonexistent. In addition, applications usually span several platforms today, so in most cases the logs cover only a portion of the transaction execution.
- **Inefficient**: in other cases the log exists, but retrieving the information, or activating the logs can be extremely resource consuming.
- **Incomplete**: end users typically exercise only a part of an application and some transactions are not executed regularly, so it is difficult to have a comprehensive view of the total application behavior.
- **Impossible**: sometimes end users are not accessing the system at all. How can a monitoring system guarantee that everything is up and running if the ultimate test (measuring the end user experience) cannot be done?

The use of synthetic transactions solves all of these problems, as you can create as many transactions as you need to exercise all the critical operations. With this method, you obtain an accurate idea of response time and system availability for all the components of the business service, regardless of the application, the log complexity, the end user activity, etc.

One downside of synthetic transactions is that as “artificial” transactions are inserted into the system, care must be taken not to introduce false data into the master files. This problem can be solved by using fake employee or customer codes, artificial product names, etc., and the use of read-only transactions. In financial environments it is common to have things such as artificial credit card numbers for testing purposes that can be used for synthetic transactions.

Another consideration with synthetic transactions is the fact that they add artificial workload to the application servers. However, the traffic of synthetic transactions is usually minimal compared to real transactions, so the benefits greatly exceed the costs. Moreover, synthetic transactions can be scheduled to run whenever desired.
Desirable Characteristics of a Synthetic Transaction Based Solution

If you are considering the use of synthetic transactions to help you meet and maintain service levels or internally mandated requirements, your chosen solution should:

- Have an easy-to-use recording feature, so it is easy to create new transactions;
- Generate a script that it is easy to understand, maintain, and audit;
- Have full script programmability, to cover any possible situation;
- Provide security for user credentials (as passwords are typically required during login procedures);
- Have the ability to distribute and remotely execute scripts on several machines, in order to measure user experience from branches and remote locations;
- Measure each transaction step independently, to detect which part of the transaction is causing a bottleneck;
- Have a good real-time alerting mechanism and integration with an enterprise console such as VISUAL Message Center SmartConsole;
- Support all kinds of application interfaces (Web, Web 2.0, Windows GUI, 3270 mainframe and 5250 midrange IBM server’s green screen applications, Unix/Linux native text-based applications, etc.);2
- Collect relevant information at detailed and summary levels and integrate with real time, web-based dashboards such as the VISUAL Message Center DashboardServer;
- Run multiple transactions from a single, non-dedicated computer;
- Predict future response time based on historical trends;
- Provide abundant SLA reporting that can be presented to upper management; and
- Have an easy way to maintain the service level thresholds for proper status setting, proactive deviation alerting, and advanced service level management.

A short note about Tango/04 Web and Universal Transaction Agents

The Tango/04 Web Transaction Agent (for HTML interfaces) and the Tango/04 Universal Transaction Agent (for any other interface) cover the requirements described above by integrating seamlessly with the Tango/04 Monitoring Engine (ThinkServer) and producing all the required information to measure end-to-end user experience, manage service levels, and perform proper Business Service Management.

Figure 1 presents an example of the kind of detailed transaction based information that is available to you with our solution.

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2 Applications with no user interface can be tested using synthetic transactions as well. For instance, email, web services or database query response time can be measured using Tango/04 ThinkServer agents. For the purposes of this paper, we consider “transactions” the interactions between users (typically using a keyboard and a mouse) and a business service of any kind.
Figure 1 – It is important to see the evolution of the response time of a transaction, and to see which transaction step is the biggest contributor to the total time, so the problem can be rapidly identified.

It is also important to note that multiple transactions can be executed concurrently using the Tango/04 synthetic transaction script runner, thanks to the support of virtual sessions.

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3 Although Windows permits only one application to have the focus, it is possible to use Microsoft Terminal Server to create a new interactive session on the monitored host. This is also more convenient, as there is no need to exclusively dedicate a computer to the execution of the scripts. If Terminal Server is not available, the Universal Transaction Agent has the ability to automatically multiplex (serialize) the transactions, both on a dedicated computer, or a dedicated Terminal Server session, so there is no interference among them.
Advanced Monitoring with Synthetic Transactions

Besides demonstrating basic compliance of SLAs or proactively identifying and solving problems in applications, synthetic transactions can be useful for many things from security projects to improvement of the image of the IT Department. In this section we describe some advanced uses of synthetic transactions that we are regularly implementing today in diverse customer projects.

Creating High-Level, Web-based Dashboards

The figure below illustrates a sample Tango/04 SmartConsole Enterprise View which can be used to display the service level status of critical applications. Color coded icons allow you to identify problem applications at a glance so you can immediately attend to the issues at hand.

Combined with email or cell-phone alerts, these browser-based dashboards can also be useful in providing status information to upper management as well as your end users, so it is possible to react immediately to any deviation.

Figure 2 – By using synthetic transactions, it is easy to create powerful web-based dashboards that show the real-time service level status of critical applications, measured from different points (headquarters, branches, etc). Dashboards like this are useful for the IT department, upper management and end users.
Drill-down capabilities are also available to provide more details about the problem. Other dashboards can also easily be created using lines, bars, or other chart types.

**Predictive Analysis of Future Response Time**

With the proper analytical engine, it is possible to leverage the historical response time data to understand the trends and extrapolate these trends into the future, for basic capacity planning purposes. Charts can show whether a consistent degradation of response exists, and the degradation speed rate. It is also possible to create combined correlation charts of the number of real end users signed onto a system and the system response time, so it is easy to understand how a system reacts to different loads. The Tango/04 DashboardServer provides these capabilities.

**Calendar-based Response Time Monitoring**

The desired response time can be different according to the time of the day or the day of the week. For instance, an internal application may have a strict requirement to consistently achieve sub-second response time for most transactions during the workday, but very relaxed requirements for nights and weekends. Tools must accommodate these varying goals and adjust alerting and SLA reporting accordingly.

**Integrating Synthetic Transactions and Application Modeling**

Synthetic transactions can detect which part of a transaction is slow or failing, so they can be very useful when you need to perform problem determination. However, the solution should be complemented by strong application modeling capabilities and comprehensive monitoring of the components of the infrastructure, so the root cause of problems can be immediately discovered as indicated in Figure 3.
Figure 3 – Cause/Effect Advanced Modeling: synthetic transactions must be properly integrated with the application model. The goal is to produce accurate information about failures, pointing the operators to the most probable cause and avoid misleading them towards effects instead of causes.

The Tango/04 SmartConsole provides for this kind of application modeling and integrates synthetic transactions in the model by using innovative, easy-to-use Cause/Effect modeling rules. In this way, the operator is always guided to the real cause of the problem (a service level threshold violation reported by a synthetic transaction is not a problem root cause per se, it is just an effect of something else that is failing).

Synthetic transactions can also be used to demonstrate compliance with SLAs as shown in the sample report illustrated in Figure 4.
Using Synthetic Transactions for KPI retrieval

Synthetic transactions can also be used to retrieve information from interfaces such as screens or spool files. This is extremely useful when the displayed information is not easy to retrieve from tables, which is common when the database design is complex, proprietary, or unknown, or when the application itself calculates data that is not present in the tables. It is also possible to use both the Tango/04 Web and Universal Transaction Agents to retrieve in near real-time such data, and integrate it to other applications. A typical usage of this capability is to scrape data from the screen of a third-
party application such as SAP R/3, use it as a Key Performance Indicator (KPI) and control that it is within certain ranges, alert when there are deviations, create web-based charts and reports, etc.

Using Synthetic Transactions for Security and Compliance Projects

Synthetic transactions can also be used in security projects to test access policies. For instance, if a user belongs to a group or role that shouldn’t have access to certain sensitive data, a synthetic transaction can be created to try to access these data periodically. Normally the transaction should fail, but if for any reason the access is granted (as a result of an unintentional or malicious configuration change) the synthetic transaction will immediately trigger an alert about the vulnerability. Immediate notification of the event helps you to minimize the impact and risk of the exposure.

Improving the IT Department Image

The use of synthetic transactions can add enormous value to the relationship between upper management, end users, and the IT department. Since they monitor exactly what your internal personnel are interested in, (i.e. availability and response times of business services, as opposed to element monitoring which is usually centered in technical metrics such as CPU, disk usage, etc.) management and users will have current information about the status of the applications accessed day to day. Furthermore, by allowing management and end users to have access to this information, you will gain several advantages:

- Reduced calls to the Help Desk to communicate failures, as end users will understand that you are already aware of the problem;
- Both management and users will appreciate your efforts in providing them with valuable, relevant information about business service levels;
- Communications between management, end users and the IT department will be improved and it will be easier to align corporate efforts towards common goals;
- The image of the IT department will improve;
- You will be able to justify funding for the monitoring project because of the visibility of benefits achieved by the solution; and
- You will be able to easily obtain funding for improving the parts of the IT infrastructure that are causing service level violations.4

4 Tango/04 Business Service Management (BSM) technology permits the creation of a ranking of the IT components that fail most frequently for each business service. This ranking is extremely valuable to help you fix (and get funding for fixing) your problem components (or to replace an external supplier, when the reason for the failure is an external factor such as a slow Internet connection provided by an ISP).
Summary

As service level management and productivity gains become increasingly important for businesses, the use of synthetic transactions to measure application availability and user response times is also becoming widespread. It is a mature technology that should be a mandatory part of any monitoring project, because it can precisely measure the quality of service provided to your end users, no matter how complex the applications.

As the information it creates is also of interest to management and end users, it offers a great opportunity for the IT department to make this data available to them in the form of real-time alerts, web-based dashboards and reports. The use of this technology will help you to satisfy your service level requirements, facilitate IT-business alignment and significantly improve end user satisfaction.
About Tango/04 Computing Group

Tango/04 Computing Group is one of the leading developers of systems management and automation software. Tango/04 software helps companies maintain the operating health of all their business processes, improve service levels, increase productivity, and reduce costs through intelligent management of their IT infrastructure.

Founded in 1991 in Barcelona, Spain, Tango/04 is an IBM Business Partner and a key member of IBM’s Autonomic Computing initiative. Tango/04 has more than a thousand customers who are served by over 35 authorized Business Partners around the world.

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- IBM Autonomic Computing Business Partner
- IBM PartnerWorld for Developers Advanced Membership
- IBM ISV Advantage Agreement
- IBM Early code release
- IBM Direct Technical Liaison
- Microsoft Developer Network
- Microsoft Early Code Release

Partnerships

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