CLABBY ANALYTICS

Research Report

IBM Tivoli Composite Application Manager (ITCAM)

IBM's Application Performance Management Environment

Introduction

One of the most vexing problems faced by information technology (IT) managers is application troubleshooting. Locating the source of a problem can involve checking error logs, performing network "sniffing", locating failed components, performing application code analysis, and more. *And cloud computing exacerbates this situation because a performance problem can occur on a virtual machine located anywhere in the cloud — making root cause analysis even more complex.*

In order to most effectively troubleshoot application performance problems, IT managers and administrators need to be able to see across their entire information systems environment. The need to know what is going on at the physical systems level, the virtual systems level, what's happening in the storage and communications subsystems, how applications are flowing, how messaging systems and Enterprise Service Busses are behaving, and how databases are reacting. In other words, they need a "*composite*" view of their IT environment. And this, in a nutshell, is what IBM's Tivoli Composite Application Manager (ITCAM) provides.

To be more precise, ITCAM enables IT managers to:

- Monitor application response to align with business expectations;
- Understand transaction flows;
- Monitor infrastructure performance and availability;
- Diagnose performance issues;
- Improve customer satisfaction; and
- Reduce mean time to repair (MTTR) and mean time between failure (MTBF).

At Clabby Analytics, we believe that application performance management (APM) environments such as IBM's ITCAM are vital and necessary element for managing cloud environments. Further, we believe that APM tools can be used to improve application/database performance — enabling enterprises to improve and optimize workload performance (to get a better return-on-investment in IT systems). For enterprises that want to do some very serious troubleshooting and performance tuning, APM products and tools are a necessity.

In this *Research Report*, *Clabby Analytics* takes a closer look at the APM discipline — and at the role that ITCAM plays in application troubleshooting, performance management, and workload optimization.

Background

In June, 2010, *Clabby Analytics* determined that application performance management would become a critical technology for the management cloud environments. As we researched this topic further, we found a paucity of comparative analysis information on APM tools and utilities available on the Internet. So, we immediately started contacting vendors of APM and business transaction management (BTM) products in order to examine the approaches that vendors use to help solve application performance management problems. Since then, we have written several reports on the APM products — including reports on the APM products and tools offered by CA Technologies, Correlense, Nastel, Netuitive, and OpTier (all of these reports are available for free at: www.clabbyanalytics.com).

On April 27, 2011, we had the pleasure of sitting through a live demonstration of IBM's APM product suite (this included a demo of ITCAM as well as IBM's OMEGAMON product sets [ITCAM is for distributed computing environments; OMEGAMON is for mainframes]). What we saw was that, from a common management platform, we could track and view on a topology map a transaction that spanned both mainframe and distributed computing environments. When a problem was detected, we were able to launch — in context — deep dive tools that could diagnose and analyze the problem as well as propose a solution. It looked so easy! It was easy! *These are the types of tools that IT managers and administrators should be using to optimize performance of their IT environments.*

IBM Tivoli and APM

One of the issues that we, and other research analysts have had with the Tivoli product line is that is so broad, deep, and extensive, it is hard to figure out which products to use to solve particular problems — and it is equally difficult to figure out the interdependencies of these products. But, in the case of ITCAM, we found that it was easy to figure out what type of problems the software could solve; and it was easy to understand the relationship between ITCAM and the products that complement it.

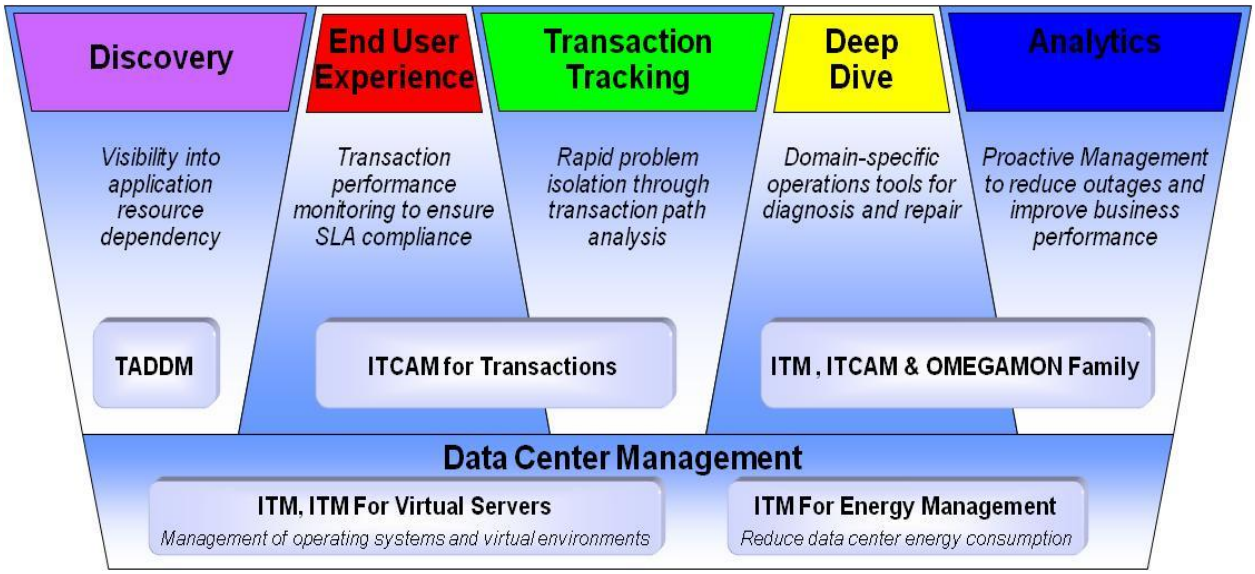
> ***The trick in understanding Tivoli APM tools is to understand the infrastructure that supports these tools — and then choose the right tool for the job from IBM's portfolio of eight APM products.***

Conceptually, sometimes, a picture is worth 1000 words. Figure 1 (next page) shows the five dimensions of IBM's APM solution: discovery, end-user experience, transaction tracking, deep-dive diagnostics and predictive analytics. And it also shows the function that each of these activities provides. Each of these functions helps solve a particular management problem. For instance:

- The discovery dimension provides visibility into applications as well as their resource dependencies;
- The end-user experience dimension measures application performance in order to ensure service level compliance;
- The transaction tracking dimension helps IT managers rapidly isolate problems through transaction tracking analysis;

- The deep dive dimension provides domain specific operations tools that assist in problem diagnosis and repair; and,
- The analytics dimension helps guide proactive management activities in order to reduce outages and improve business performance.

Figure 1 – IBM's Application Performance Management Portfolio



Source: IBM Corporation, April, 2011

Getting Started — You Need to Build a Common Infrastructure to Support APM

IBM offers a variety of APM products each with a specific purpose (described in the next subsection). But, before examining those products, it is necessary to understand that a common underlying infrastructure needs to be in place to support troubleshooting and performance tuning activities. There are three underlying infrastructure elements that enable the integration of the APM portfolio:

1. IBM Tivoli Enterprise Portal (TEP) is the central interface for monitoring and management. It uses IBM's ITM (IBM Tivoli Monitoring) as a basis to monitor resources and provide a visual view of activities within a given IT environment. From this unified interface, administrators can see application topology, track application transactions and perform application diagnostics (that can be launched in context). And when a problem is identified, "expert advice" is displayed with suggested actions or preset alerts can automatically invoke scripts to fix problems.
2. IBM Tivoli Data Warehouse (TDW) stores all historical systems management data from multiple ITM and ITCAM sources including operating systems, virtual servers, application servers, databases and applications and is the source of information used to examine trends, do proactive analysis, and generate comprehensive reports on application environment status, and capacity trending, for example.

3. IBM Tivoli Common Reporting (TCR) collects ITM and ITCAM data from the TDW that can be correlated, displayed and formatted for reports such as peak hours of usage and server utilization by week, day of the week, hour of the day or even a string of hours over a given week.

Leveraging a single user interface, single data warehouse and single reporting capability across the entire APM suite helps reduce the complexity of multiple management products from multiple vendors, improves user productivity and allows proactive management, preventing problems before they can impact users.

ITM also provides predictive analytics including dynamic thresholds which baseline a server's behavior over a specified period of time, and will alert when server behavior is abnormal, allowing problem identification. These are auto-generated for each key metric by agent based on learned behavior, or they can be set by the administrator. Capacity and performance analytics provide monitoring, alerting and reporting on a future event, based on historical information.

IBM's APM Portfolio — Product Descriptions

Once the supporting infrastructure is in place, IT managers can then choose the Tivoli APM tools that best meet their troubleshooting and tuning requirements. These include:

- Tivoli Application Dependency Discovery Manager (TADDM) – provides discovery and resource dependency mapping, configuration auditing;
- IBM Tivoli Monitoring (ITM) – provides system resource monitoring software to manage operating systems, databases and servers in distributed, virtualized and host environments;
- ITCAM for Transactions – tracks transaction behavior and end-user experience featuring both agent-based and agentless transaction tracking;
- ITCAM for SOA – supports performance and availability monitoring of SOA platform including IBM WebSphere, Microsoft .NET and BEA WebLogic;
- ITCAM for Applications — provides availability and performance monitoring solution for applications and application infrastructure including operating systems (agent and agentless), virtual servers, database servers, email and collaboration tools, messaging middleware, web resources and applications;
- ITCAM for Microsoft Applications — delivers availability and performance monitoring specifically for Microsoft applications and application infrastructure environments;
- ITCAM for Application Diagnostics - supports monitoring for web and application servers, and also deep-dive diagnostics for WebSphere and other JEE environments; and,
- IBM Tivoli OMEGAMON — provides mainframe monitoring and diagnostic component.

How ITCAM and OMEGAMON Work Together

Of the above mentioned APM solutions, the ones we believe provide the core capabilities for troubleshooting problems within a cloud environment include:

- IBM Tivoli Composite Application Manager (ITCAM) for Transactions;
- ITCAM for Applications;
- ITCAM for Application Diagnostics; and,
- IBM Tivoli OMEGAMON.

The remainder of this section takes a closer look at each of these product sets.

IBM Tivoli Composite Application Manager (ITCAM) for Transactions
ITCAM for Transactions follows the path of a transaction from end to end, through a mainframe or a distributed system, and through both physical and virtual infrastructure. Transactions are traced across Java Virtual Machines (JVMs) and into Customer Information Control System (CICS) and Information Management System (IMS) using data collectors that provide integration between the two. Transaction tracking is particularly important in cloud environments to provide insight on what's happening once a transaction enters the cloud and to support service level agreements (SLA's). Problems at any layer in the infrastructure can be quickly identified and information about response time and end-user experience is also readily available.

By learning infrastructure components, and using token-based and dynamic correlation to automatically generate topology maps that illustrate the entire transaction end-to-end, the administrator can easily see all elements of the transaction. Using historical data, thresholds for each layer are created. When a threshold is exceeded, the topology map displays the problem area in red so the problem can be easily identified.
ITCAM for Transactions also includes end-user response time monitoring by using an agentless web response monitor or a low overhead appliance mode. Data is collected from real web-based customer transactions and Windows applications. By analyzing real-user situations as well as using robotic simulation, response times can be monitored and displayed so that response time can be correlated to service level agreements (SLAs). Also significant is the ability of ITCAM for Transactions to link to ITCAM for Application Diagnostics (more on that later in the document) so that you can launch in-context deep-dive analysis directly from the topology mapping.

> ***What is unique about ITCAM for Transactions is that a recent product revision added appliance-based agentless transaction tracing as an option to agent-based instance level tracking. Agentless tracking uses a low overhead packet sniffing technique to capture information without a resource specific data collector, stitching together both agentless and agent-based information for a seamless view. This approach is quick and easy to deploy and can be used for some infrastructure elements while agent-based data collectors can be used where more detailed information is required. This enables businesses to have some visibility without the extra overhead and cost of additional agents. Agentless tracking is also great for small companies that don't have the budget or support resources to implement and interpret all the information gathered by multiple data collectors. Companies may choose to roll-out agentless tracking as stepping stone, deploying agent-based transaction tracing in a phased fashion as resources permit and/or as requirements dictate. This approach puts to rest the argument over which is better--agent-based or agentless—allowing the customer to choose and customize a solution can use both working together.***

ITCAM for Applications

ITCAM for Applications is an availability and performance monitoring solution for a wide range of applications and application infrastructure including operating systems (agent and agentless), virtual servers, database servers, email and collaborations tool, messaging middleware, web resources and applications from a single management interface. ITCAM can improve mean-time-to-recovery and pursue incident avoidance for all these environments, as well as do things like determine appropriate virtual server workloads, provide visibility into CPU and memory usage, optimize service levels, and quickly isolate problems. Views can be customized based on organizational roles, ensuring relevancy of displayed data and metrics.

> ***Packaging for ITCAM for Applications is pretty straightforward. There are two options: (1) ITCAM for Applications 3 pack -includes licenses for any 3 agents and enables applications and monitoring to be moved between servers as needs change. If a server is repurposed the three agents are easily exchanged for the same number of different agents and (2) ITCAM for Applications Full Pack- for large enterprise customers with stable configurations, any agents can be chosen and pricing is based on capacity. These options provide the flexibility for smaller customers to get enterprise level application monitoring without being forced to purchase agents they don't need.***

Agents include:

- Operating systems AIX, Microsoft Windows, Linux, Solaris, HPUX and i5/OS;
- Virtual servers AIX LPAR/DLPAR/WPAR, Sun Solaris Zones, VMware, NetApp, and Citrix virtual client;
- Database servers IBM DB2, Oracle, and Sybase;
- IBM Lotus Notes and Lotus Sametime;
- Web resources including web servers, application servers, Java Platform and Enterprise Edition (Java EE) applications;
- IBM WebSphere MQ, WebSphere MQ File Transfer Edition, and WebSphere Message Broker; and
- Enterprise applications SAP, Siebel and PeopleSoft

ITCAM for Application Diagnostics

As important as tracing transaction behavior and understanding end-user response time is having the ability to drill-down to discover the root cause of a performance problem once it is isolated. ITCAM for Application Diagnostics supports monitoring of application and middleware environments (such as JEE, CICS, IMS and IBM WebSphere), monitoring of high-level application health and essential application resources and also deep-dive diagnostics for application servers. ITCAM for Application Diagnostics can be launched in context from ITCAM for Transactions through dynamic workspace links. From the transaction topology map, the appropriate deep-dive tool is invoked based on data source.

ITCAM for Application Diagnostics can locate bottlenecks, application code defects, memory leaks, and server resource issues for quicker problem resolution and improved MTTR. Performance metrics captured include JVM heap usage for JEE servers, message queue status for WebSphere MQ, and lock conflicts for databases. Detailed method trace information can be displayed for any transaction, even those that cross into CICS or IMS back-end subsystems.

Other features:

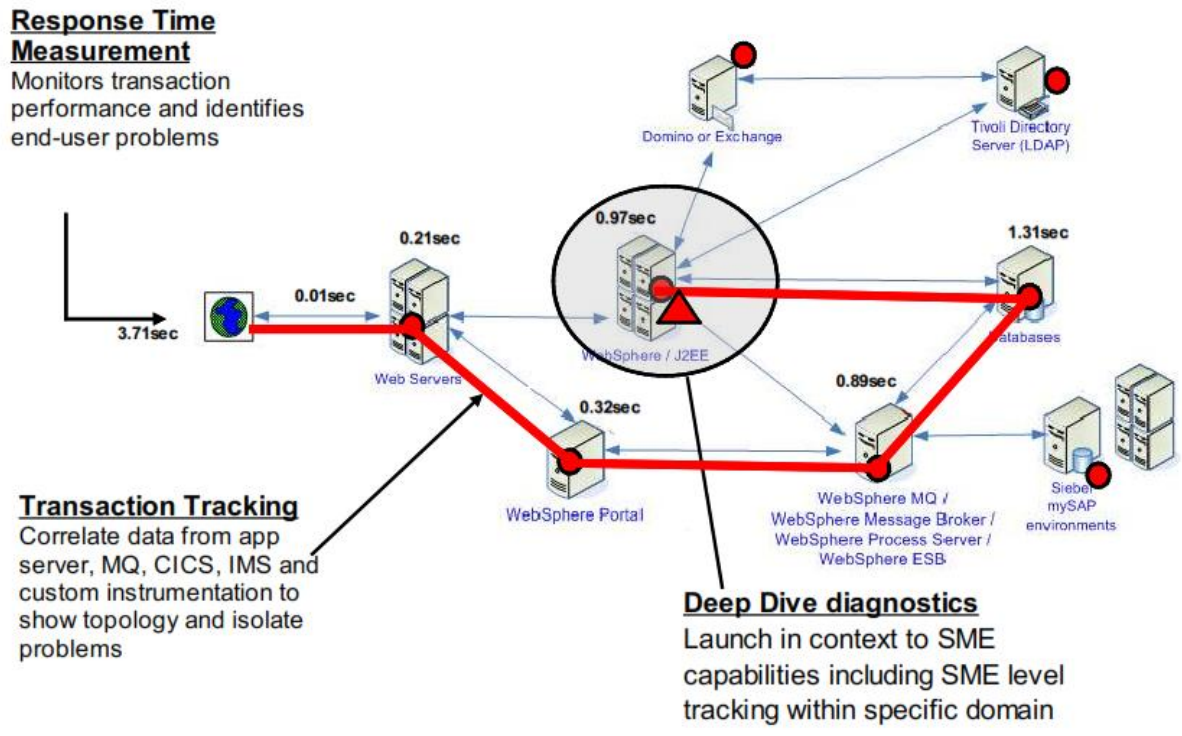
- Monitoring levels can be adjusted based preset events or on-the-fly (minimizing overhead)
- Access to real-time and historical data from a single dashboard
- Integrates with IBM rational tools for better application lifecycle management
- Monitors hundreds of JVMs from a single management station

IBM Tivoli OMEGAMON

The IBM Tivoli OMEGAMON family of products provides a comprehensive performance and availability solution to proactively analyze and manage mainframe operating systems, databases or other environments for optimal performance. It is available with seven different choices of agents (each sold separately) including CICS, DB2, networks, storage, and z/OS and helps detect bottlenecks and other potential performance problems and quickly isolate the source and takes action automatically to resolve these issues. OMEGAMON basically provides in context "deep-dive" capabilities for mainframe components.

Figure 2 (below) illustrates how ITCAM for Transactions, ITCAM for Applications, OMEGAMON and ITCAM for Application Diagnostics work together

Figure 2 – IBM's APM Suite Combines End-to-End Monitoring, Tracking and Diagnosis, All Managed from TEP



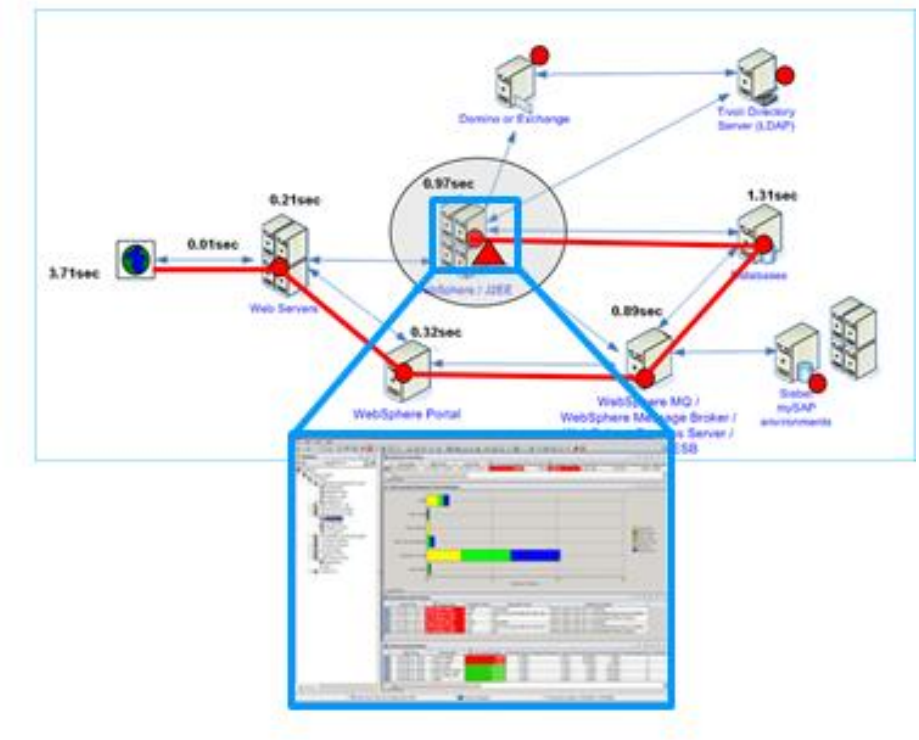
Source: IBM Corporation, April, 2011

Use Case — Online Trading Application

In Financial Services, an online trading application can illustrate the benefits of IBM's APM suite. Let's use the example of a new online trading application that was updated last week. In production, this new revision has a severe performance problem that occurs intermittently. Because of this issue, the company is losing money in potential sales and also impacting customer response time and customer satisfaction.

Built-in alerts of ITCAM for Transactions have let us know that in the past week, random trades have been taking longer that the pre-set 5 second service level. In the discovery phase, TADDM's configuration auditing captures changes on the WebSphere Application Server (WAS) from the rollout of a new version of the online trading application a week ago, narrowing the problem to those areas that were updated. ITCAM shows the problem area on the topology map (See Figure 3).

Figure 3 -From the ITCAM Topology View (shown below), application bottlenecks are quickly identified to show the failing component and in context deep-dive diagnostics are launched.



Source: IBM Corporation, April, 2011

In this case, the Trading_Server1Node on server1 appears to be the issue. Now that we've isolated the failing component, we can drill down and start troubleshooting the issue on the WAS server, which is the server where a change had been made. Looking at the WAS server metrics for several hours prior to the last alert, and analyzing key metrics such as heap usage and garbage collection, it is evident that heap usage is high and increasing, and

garbage collection is running frequently. This indicates that there's a memory leak or other memory issue.

Troubleshooting points toward a memory issue as the root cause (which makes sense because they can take a while to occur and, if the app server is restarted as a quick fix it will clear up and then reoccur as the memory is eaten up again). With ITCAM, there are several memory diagnostics tools that provide the ability to get down to the line of code suspected of causing the memory leak. The developer then has isolated the root cause in the code, completes the repair, and rolls out the fix.

With ITCAM's forward trending capability, other potential issues can be predicted. For example, insight into the increasing load on the web server as a result of adding users can signal a potential web server outage. IT administrators can use this information to add another web server to balance the increasing load – proactively eliminating a potential outage and costly downtime.

Summary Observations

Understanding ITCAM is simple: 1) first, it is necessary to build an underlying infrastructure that can provide information to ITCAM applications; and, 2) then, second, choose the application(s) that are needed to serve your IT needs from Tivoli's portfolio of eight APM solutions.

The benefit of being able to choose from a variety of components is that IBM customers aren't forced to buy components that they may not need. By the same token, *Clabby Analytics* does believe that IBM might benefit from having some packaged offerings tailored to particular workloads or business needs, making it easier for customers to order and implement.

There are several aspects of the ITCAM/OMEGAMON product suite that we believe are worthy of special note:

- The architecture and common underlying elements that span the tools in the Tivoli product line: TEP (display), TDW (data warehouse) and TCR (reporting) provide the foundation for integrated analysis, reporting, and visualization, eliminating any incidence of "siloes" across the infrastructure.

- The ability to merge both agent-based and agentless transaction tracking data into a single unified transaction representation is unique, and gives customers unmatched flexibility, problem isolation capability, and visibility.

- Support for both mainframe and distributed systems means IT managers and administrators can see across their entire information systems environment and can follow transaction behavior through virtualized cloud environments, providing a composite view. Deep dive capabilities enable root-cause analysis anywhere in the cloud.

For clients in banking, insurance, retail and healthcare, APM tools are essential-- especially as these businesses start to adopt public, private, and hybrid cloud architectures. IBM has a comprehensive and integrated APM product line that encompasses discovery, transaction tracking, application monitoring, deep diagnostics and predictive analytics. These products, in combination with the rest of the Tivoli product set and IBM's strong service and support, position IBM well positioned in the fast-growing application performance management market.

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