WHITE PAPER

End-End Software™

Application Performance Management Software

END USER EXPERIENCE TOOL

1. Executive Summary

1.1 End-End Software™ – Solution Objective

Large organisations demand ongoing availability and reliability from their IT systems. Maintaining best-practice delivery of application services is crucial across widely distributed enterprise applications.   A lack of best practice results in the deployment of an application without acknowledgment of mandatory availability and service level objectives.   Measuring application performance is the recommended way to uphold these requirements, and to manage and improve service delivery response. The most effective way to measure performance is from the perspective of the end-user.

Research has confirmed that application performance management is a crucial component of an organisation's IT system/infrastructure.   Response time tools provide meaningful, accurate measurements that can be used to understand the response-time characteristics of business-critical applications.   Industry analysts advocate that large enterprises deploy these tools immediately because they provide invaluable information that assists organisations in establishing and meeting service level goals, and in interpreting performance and the end-user experience to increase customer satisfaction.

It is envisaged that total application system performance will be formally measured as a key factor in determining the overall business value of IT.   The synchronisation of business objectives and performance with measurable and reportable IT components will allow organisations to more clearly structure and define their role in the IT enterprise as well as significantly increase client satisfaction.

The recommended technology approach is user-focus and transaction-based.   Response time monitoring software monitors application performance from the perspective of the end-user in real time, thereby complimenting existing infrastructure management tools to ensure business IT availability and accountability at all times. This White Paper outlines why End-End Software™ is the functional, proactive way to sustain business-critical applications down to transaction level.

1.2 What is the business problem that End-End Software™ solves?

End-End Software™ assists large organisations in the reliable delivery of information, data and applications to end-users. End-End Software™ efficiently responds to distributed applications across an organisation's topology so that the appropriate response can be determined and actioned as quickly as possible. End-End Software™ application management allows organisations to view distributed applications from the end-user's perspective to establish application performance levels and address inconsistencies immediately.

End-End Software™ tracks every transaction from the desktop through the enterprise, monitoring application performance as it is experienced by the end-user. End-End Software™ captures exception information so IT receives 'early warning' of impending system problems together with the client, network, server and transaction details required to intelligently resolve them.

End-End Software™ captures the actual end-to-end application experience of each individual user. This produces the information necessary for application service level reporting, baselining, trend-lining, benchmarking, profiling and more detailed analysis. This unique combination of features will enable organisations to more directly align their IT and related operations with overall business and unit objectives.

Additionally understanding what your end-users are experiencing at your other locations such as London, Madrid or Singapore is another key concern. Do these end-users use the same applications or even do the same transactions. What is the response time of those transactions at these remote offices compared to your main location and other end-users.

2. Criteria for Successful Application Performance Management Solution

2.1 Recent research and development of enterprise-level systems suggests that performance management tools that also integrate application response time will indicate how the entire IT infrastructure supports core business objectives.

2.1.1 Match Performance to Business Objectives – measurements should revolve around business applications and should be determined by key items in the infrastructure

2.1.2 Match Tools to Requisite Measurements – only when the relevant measurements are determined can the appropriate tools be sought

2.1.3 Match Reports to Audience – the right tools will generate reports that accurately reflect business/IT objectives, and deliver these reports to a correctly defined audience

2.1.4 Non-Intrusive – provide response time measurement without imposing a performance penalty on the user and without requiring any changes to the monitored applications

2.1.5 Collect Significant Transactions from Actual Users – application performance metrics are measured at a significant transaction level not just as network activity that cannot be directly linked to specific user action. Feedback is provided to the business unit based upon real data, not consolidated or simulated data. Solution must be impervious to all encryption technology (now commonly deployed in enterprise solutions)

2.1.6 End-user Profiling – understanding what your employees are experiencing throughout the day and how they use applications and what transactions are most used

2.1.7 Ease of Deployment and Use – easily and rapidly deployable, leveraging existing software distribution mechanisms. Solution should require minimal effort to collect significant data. Should maintain and purge own data files

2.1.8 Comprehensive Analysis – provide complete set of easy-to-use analysis reports to accommodate application benchmarking, performance trends monitoring and exception analysis. Analysis reporting should provide responsive results

2.1.9 Support for Packaged, Customised and Internally Developed Applications – single solution capable of monitoring a broad range of application solutions, including packaged, highly customised commercial solutions, as well as one-of-a-kind internally developed custom applications

2.1.10 Exception Notification – detects performance exceptions and allows for external notification and execution of appropriate action plan based on client and application

2.1.11 Determine Source of Performance Issues – assists in determining source of performance variances

2.1.12 Easy Access to Response-Time Metrics – puts all performance metrics in open, accessible data repository

2.1.13 Scalable – accommodates the needs of a 24x7 operation, capable of monitoring the transaction volume of thousands of users

2.2 Methodology

End-End Software™ measures transaction response times, providing true 'end-to-end' or Total Response Time metrics on the End-Users experience. Total Response Time is the complete end-to-end 'round trip' time calculated from when a user initiates a transaction request until the response is seen on the relevant client PC. In addition to the duration of round trip transaction response time, basic profile statistics are maintained for each type of transaction.

End-End Software™ auto-detects applications as they are accessed from the desktop, automatically identifying the host IP address at the beginning of user activity. The software then uses this address to identify network traffic to/from the workstation. Even if an IP address changes during the time on/at a workstation, End-End Software™ will correctly record all transactions.

In Windows-based applications the response time is associated with the active window of the application in which the user is working. The E2Eagents™ track application activity via window name changes that occur at the beginning and end of every application transaction.

The lightweight agents that are the core of End-End Software™ therefore recognise end-user network request activity and determine the appropriate application transaction requests associated with this activity. Minimum performance of End-End Software™ in this instance is calculation of round-trip response time for end-user network requests. Since End-End Software™ monitoring occurs on the client, this product is not sensitive to the successive N-tiers of the application.

2.2.1 Web-based and JInitiator-based Applications

End-End Software™ also monitors Java-based applications via a specifically-developed additional agent.

The E2E J-agent™ is a plug-in adapter that provides support for monitoring lightweight Java applets specific to Oracle 11i. These components are normally invisible to other Win32 applications as they are pure Java objects. The E2E J-agent™ reflects titles from Oracle 11i windows into their Win32 container window, allowing transaction data to be logged and measured.

2.2.2 TN3270 Applications or similar

End-End Software™ also monitors TN3270 applications that do not have a terminal emulation package overlay. Effectively, there are no window name changes to detect (as found in a typical client/server application) but there is still TCP/IP activity that can be detected. In addition to the transaction response times calculated across a network, End-End Software™ will also monitor some terminal emulators that use a background process to do the same.

The E2Eagent™ monitors only applications that use TCP/IP protocol to communicate to the server(s). The concept of request/response roundtrips is characteristic of TCP/IP-based network activity. End-End Software™ monitors these request/response cycles to analyse the start and end of each transaction, and it is this data that is used to determines response times.

In the case of the TN3270 applications, there are no window title changes to designate different transactions so the E2Eagent™ will only associate the network response time calculated with the non-changing title, irrespective of other end-user transaction(s) at that time. No information relating to the actual transaction performed by a TN3270 application will be determined because End-End Software™ does not sniff packets, but only detects and calculates the timings of the request/response cycle.

2.2.3 Monitoring in a Thin Client environment

E2E Thin Client Agent is designed to monitor two of the leading Thin Client environments, Citrix Metaframe XP & Microsoft Windows Terminal Server. It has an option to set-up either one during the installation.

The E2E Thin Client Agent is only installed on the Metaframe XP Server or Windows Terminal Server. The actual transaction is triggered from the Server, and when a user establishes a session, an instance of the E2E Thin Client Agent is started on the Citrix/Terminal Server and the agent will monitor all activities going out of the server.

The transactions are separated by the user's desktop who has created the Citrix/Terminal Server session. The same philosophy of monitoring still takes place capturing client time, network time and server time. With the agent residing on the Citrix/Terminal Server E2E will report this as client time.

2.2.4 Monitoring Agents on a Unix desktop

The E2E Uagent is a Unix agent that resides on the desktop and runs on the Sun Solaris/Redhat Linux operating system. It monitors the transaction names based on the titles of the applications running on X Windows. The Unix agent gathers the same performance statistics like the regular E2E Agent. It is typically the same E2E Agent for Sun Solaris/Redhat Linux, it connects to the regular End-End Software™ backend server components like the regular E2E Agent. The E2E Uagent has all the features of the standard E2Eagent

3. End-End Software™ Architecture/Design

3.1 Diagram of End-End Software™

End-End Software™ employs non-intrusive agents to collect front end metrics based on the end-user's experience of application and transaction performance. The E2Esupervisor™ communicates with each agent, and with the console and repository. The repository and the console also communicate directly to provide more efficient report generation. This also reduces overhead on the E2Esupervisor™.

End-End Software's Architecture:
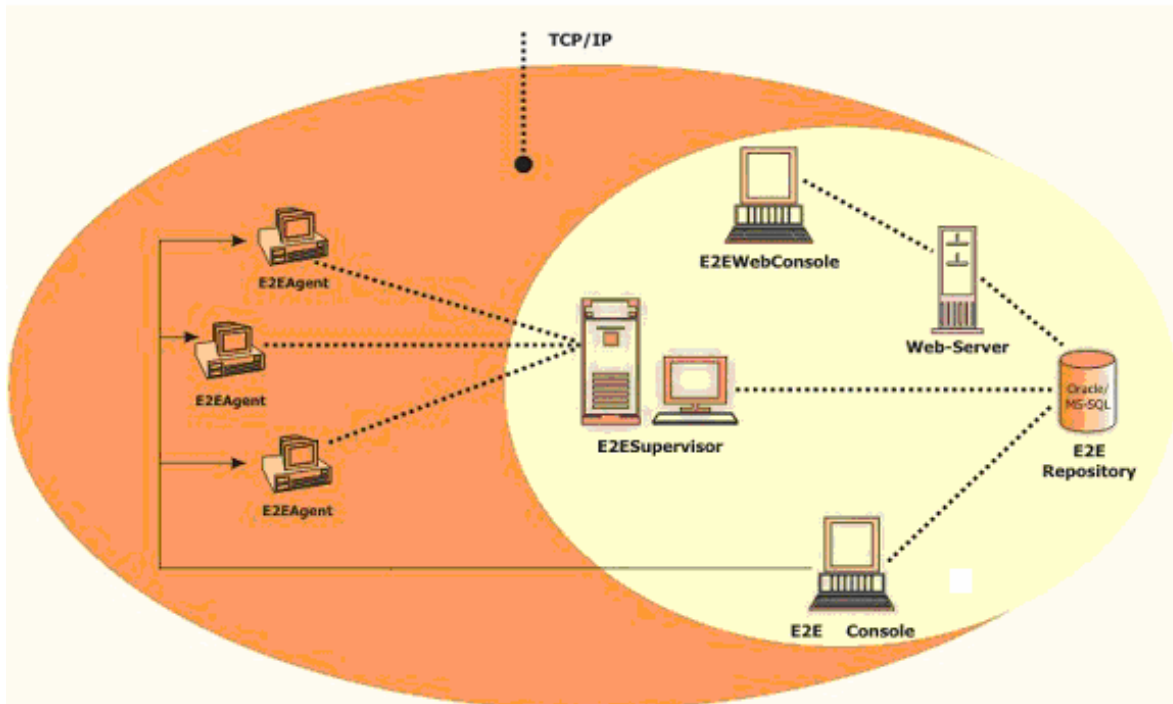
3.2 CORE Technology Components

End-End Software™ provides a front-end response time monitoring solution comprising the following core components

3.2.1 E2Eagent™

Client-focus agent that continually monitors and calculates statistics on application performance by application, by transaction and by time of day. Agents determine exceptions to response time objectives. Runs as a background .exe in Microsoft Windows 9x/NT/2000/XP Unix Sun or Redhat.

Features:

      Small footprint, low impact

Autonomous monitoring

Auto-detection of applications

Configurable parameters

Auto-discovery

User-friendly name structure

3.2.2 E2Esupervisor™

Controls all E2E™ services

Runs as a service in a NT/2000 server/workstation

Collects data from E2Eagent™ and stores it in the E2Erepository™

Performs aggregation of collected data at regular intervals

3.2.3 E2Econsole™

User interface providing a centralised window for managing End-End Software™ as well as consolidated performance analysis for comprehensive, interactive, context-sensitive reporting. Communicates directly with the repository to produce data for reports

GUI for End-End Software™

Instantaneous view of clients, servers and client-groups

Provides compiled data in the form of reports aided with charts based upon user-selected criteria

Tool tip for each report (appears by clicking the black dot on every graph)

Use to promote an auto-detected application

Use to disable an application

Indicates running state of agents in the last 30 minutes

Use to remotely start, restart or stop an agent

Use to remotely monitor an agent

Use to remotely configure an agent

Use to create client-groups

Use to give 'friendly names' to clients, applications and servers

Use to enter exception threshold values per application per client

Saves reports as HTML or Excel files

Saves charts as JPGs

Use to print reports

Provides two types of log-in (Administrator and User)

Provides comprehensive 'Help' resource for End-End Software™

3.2.4 E2Erepository™

Centralised data store for End-End Software™ containing configuration information including performance objectives:

Storage point for data collected

Client and server profile data

Normalised to ensure quick response times

Detects and stores exceptional transactions based on user-set values (Exception Threshold)

Keeps track of running condition of agents

Deletes old data automatically

3.3 NON-CORE Modules and specialised agents

3.3.1 E2EJ-agent™

This additional module plugs into the existing E2Eagent™ to capture Java applet activity down to canvas level, which differs significantly from typical Windows-based technology. Specifically designed to monitor JInitiator-based applications such as Oracle 11i.

3.3.2 E2E Web Console

The Web Console is installed on the local web server so that E2E™ reports or other data from the browser can be accessed from specific desktops. End-user access can be limited to 'View' mode.

3.3.3 E2E Informer™

This module is used to display the last transaction recorded by the E2EAgent™ running on the client machine. This data is picked from the local file where the data is stored before sending it to the E2Esupervisor™.

3.3.4 E2E OverView™

This module is used to report on the response time of up to seven (7) applications at one time, allowing you to select applications and provide a real-time graph on the performance of these applications. The GUI displays an application's average response time in seconds plotted every 15 minutes. This graph refreshes every 15 minutes to reflect the latest data.

3.3.5 E2E Thin Client Agent

E2E Thin Client Agent is installed only on the Citrix Metaframe Server or Windows Thin Client and not on the individual desktops. The Agent monitors all applications that have been published on the Citrix/Terminal Server provided they generate network traffic to other servers using TCP/IP protocol. The E2E Thin Client Agent calculates the transaction times from the Citrix/Terminal Server to the other servers. All the transactions are monitored for each individual user who creates a session on the Citrix/Terminal Server. Currently supports Citrix MetaFrame XP on Windows 2000 Server with Service Pack 3.

E2E U Agent

E2EU-Agent is a Unix Sun Solaris or Redhat operating systems desktop agent, that monitors client/server application. It also supports different platforms like SPARC and Intel version. E2EUAgent has 32 bit and 64 bit version for Solaris or Redhat operating system.

4. How It All Works

4.1 Agents

The unique set of E2Eagents™ is the core of End-End Software™. They continually monitor end-user transaction activity, determining application transactions as they happen (in real time). For each application and transaction E2Eagents™ calculate the total response time. E2Eagent™ monitor all TCP/IP network activity in Intel-based Microsoft Windows 9x/NT/2000/XP, SUN or Redhat UNIX platforms.

*E2E*Agent Architecture
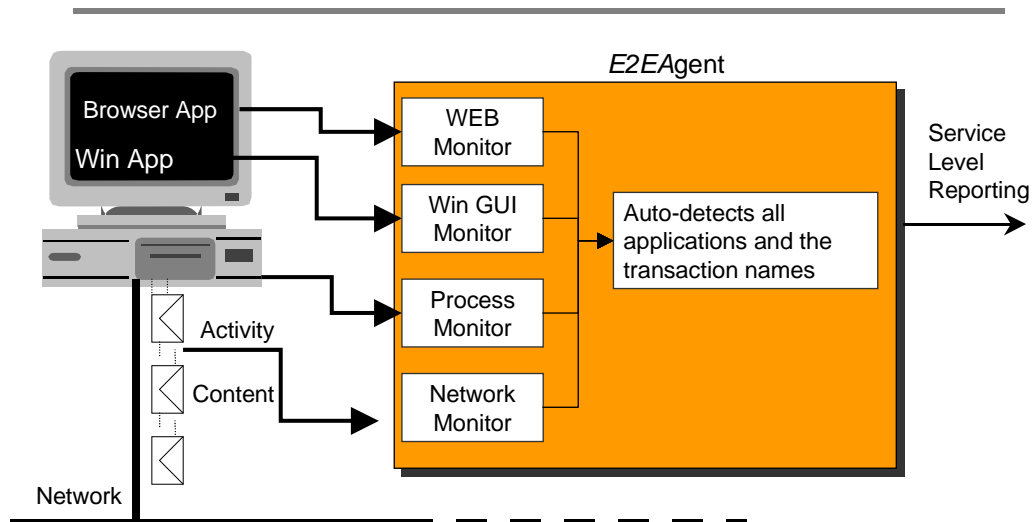
The agent employs multiple techniques to identify significant transaction start/stop markers or request/response. Each agent monitors several sources for significant events including:

        the presence of network activity

        window name changes

        content of the network activity

E2Eagents™ have been carefully designed for Minimal Performance Load. The proprietary technology of agents means they consume very little client CPU and/or network resources. There is almost no disruption to the user and a negligible negative effect on performance.

4.2 Integration

Although a number of infrastructure tools are currently available to monitor server and database performance as well as accessibility and network performance, overall these individual monitoring tools provide neither the perspective of the end-user nor an overall view of the enterprise.

To remain effective, application performance monitoring software must fully integrate with existing system or framework management tools. Response time monitoring solutions must also work with helpdesk applications to provide additional meaningful data. It is no longer efficient or sustainable for an organisation to rely on separate monitoring tools to ensure performance levels and SLAs are maintained.

4.3 Application monitoring at transaction level

End-End Software™ monitors the response time for each component of the transaction, also the window dialogue steps, as well as the most basic transactions. In some instances the primary focus is the time elapsed between completing all the required pieces of information. In other cases, there is a need to examine the entire time period from when the user initiates the process of completing all the required information until the time they receive the confirming message back from the application.

4.3.1 Effective use of Network: Infrequent communication

Agents monitor and collect data autonomously, via transitory short bursts of communication with the supervisor every 15 minutes. During these regular connections, the supervisor picks up the most recent performance statistics that the agent has collected and calculated over the previous 15 minutes.

4.3.2 Effective use of Network: Small amount of traffic

The amount of data sent from E2Eagent™ to E2Esupervisor™ in a given 15-minute interval is driven by the number of *different* transactions executed by the end-user, and by the number of different servers to which those users are connected. E2Eagents™ make use of this efficient localised data aggregation so that End-End Software™ can efficiently monitor and maintain performance statistics on all end-user application activities for a large number of users.

4.3.3 Scalability

Given a typical environment, a single E2Esupervisor™ configuration will support many thousands of E2Eagents™ without significantly affecting the network infrastructure or degrading the performance of End-End Software™. This is because the supervisor has a dynamic threadpool to process the agent data. The moment at which agents initiate communication is staggered over the 15-minute

interval; only some of the agents need to communicate at the same time. (Note: The maximum number of agents depends on the power and configuration of the server.)

4.3.4 Meaningful Measurement

The core benefit of End-End Software™ is its ability to measure end-user response time in a meaningful application-user context. A measurement of low-level network packet activity alone is insufficient and, as a network metric, does not correlate in a meaningful way to the end-user's experience. If poor performance cannot be readily related to end-user application functions, it will not provide sufficient detail for IT to act in response to and improve the application performance.

4.3.5 Efficient control

E2Esupervisor™ coordinates all End-End Software™ communications. The E2Esupervisor™ is multi-threaded and can perform all of its tasks simultaneously. It collects data from the E2Eagents™ and updates the repository with the latest performance statistics while managing configuration data for the console.

4.3.6 Profile Statistics Maintained by Application, by Client, and by Time of Day

> Transaction Name
> Client Processing Time
> Network Time
> Server Time
> # of Round Trips
> # of Bytes
> Server IP

4.3.7 Transaction Definition

Transactions are defined by the application. In most organisations, an application will have a number of windows or forms, and E2E™ can monitor every transaction.

End-End Software™ is powerful and flexible enough to view the response time of every single component of each transaction. Group transactions are created in the Ruleset and viewed via the Console.

It is important to note that transactions are not completed by a single network round trip and may require many arbitrary bursts of network activity.

4.3.8 Rulesets

Rulesets are controlled via E2Econsole™. The role of the Ruleset, which resides on the E2Econsole™, is to provide grouping of similar transactions together to produce meaningful reports. The agent identifies the transaction and collects the actual response time, then data is sent to the supervisor and then to the repository. Rulesets group meaningful transactions together, by application. Each application falls into one of several types, each with its own signature that informs the Ruleset how to process the activity for that application.

Different transaction rules can be customised at the E2Econsole™ into generalise groups e.g. Purchase Orders. Most rules that are created can be for a specific transaction name, or can be designed to be broad enough to recognise a wide range of possible transactions/applications.

The Rulesets are stored in the E2Erepository™. Modifications to the rules or the addition of new application rules can be achieved quickly and simply via the System Administrator at the Console.

4.3.9 Diagnostics

When service levels are exceeded (e.g. purchase order > 5 seconds), End-End Software™ will inform the end-to-end transaction path involved in that specific exception event. E2E™ will tell you:

 the exact client experiencing the performance problem

 the specific server the client is connected to

 the transaction that exceeded the threshold

 the component; client, network or server times

4.3.10 Automated Exception Events

Client-based E2Eagents™ collect the round-trip response time for a given transaction and send the data to the supervisor in 15-minute intervals. The supervisor controls all exceptions, the system compares the exception parameter with 'actual' each time, and if the total time taken is more than the threshold, it sends the data to the exception table, which is also used for printing the exception reports.

For each exception event, you can determine which is the appropriate notification plan to be executed. Notification plans allow for performance exception events to be made known externally as well as automate certain remedial and reporting actions. Notification is by email or SNMP traps.

4.3.11 Self-Maintaining Repository

End-End Software™ maintains performance statistics to enable the collection of actual performance data in an efficiently-sized data repository. Unlike some solutions that maintain full recordings of all transaction activity and quickly fill up disk space, End-End Software™ does not require you to be selective about the transactions or users for which you maintain data. The E2Esupervisor™ is

responsible for maintaining the data repository by aggregating the performance statistics for each transaction into larger time intervals as it ages. E2Esupervisor™ performs regular aggregation and purge so that the repository does not fill up and require manual intervention.

4.3.12 Reporting

The database has been designed to minimise report generation time. End-End Software™ is shipped with a comprehensive set of analysis reports geared towards different stages of deployment. Its real strength lies in an efficient repository, so selection filter criteria are independent of the report definitions, thereby allowing tremendous flexibility in reporting.

The software's reporting functionality is enhanced by its unique customised reporting features. Graphs can be colour-coded, selected by date, client groups, transactions and servers just to name a few. The reports are easily customised for prompt recognition and increased efficiency; additionally the Schema is open and available. This further assists organisations in meeting internal reporting requirements.

5 Conclusion

End-End Software™ meets the challenges of the real world through the provision of a flexible, responsive and synergistic Application Performance Management Solution.

End-End Software™

    Collects all transactions from actual users

    Captures data non-intrusively without detectable performance impact

    Is easy to deploy and use

    Includes comprehensive analysis tools

    Supports packaged, customised, and internally developed applications

    Offers exception notification (SMS/email)

    Determines the source and/or location of performance issues

    Is scalable and Integrates with existing systems

End-End Software™ is uniquely architected and designed to deliver exceptional results for business-critical and high-demand fully deployed enterprise applications.

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