APPENSURE

AppEnsure End User Centric APM

Product Overview

August 2017

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Introduction

AppEnsure provides application performance management (APM) for IT Operations to proactively provide the best end user experience.

AppEnsure allows IT Operations to manage every application they have in production, irrespective of the source of that application (legacy, custom developed or purchased), the operating system platform (Windows or Linux), and the execution environment (physical hardware, data center virtualization, private cloud, hybrid cloud, or public cloud).

At AppEnsure, we believe the focus of application performance should always align with business goals and be obsessively focused on end user experience – the critical metric for enterprise APM.

Key Benefits

- Detect application issues before they affect your end users
- Evaluate user experience, effectiveness, efficiency and productivity
- Recognize real user demand for applications
- Monitor and validate Service Level Agreement (SLA) compliance
- Discover what is normal and determine if normal is optimal
- Identify the components and applications that are causing performance issues
- Expedite diagnosis and remediation of performance problems

Key Capabilities

End User Experience measured on real transactions – Synthetic transactions will never reflect the reality of the world. AppEnsure focuses on real transactions to prevent performance problems before they cause disruption of business processes. AppEnsure gives IT Operations improved visibility into their IT infrastructure and the ability to identify potential problems before end users start calling the help desk.

Monitor the impact on end user experience across infrastructure tiers – AppEnsure provides the ability to evaluate the impact of each of the infrastructure tiers or services that an application is dependent upon for the quality of the end user experience, by correlating response time measurements taken at different points in the application service delivery chain.

Unprecedented end-to-end visibility for Citrix environments - Citrix XenApp and XenDesktop provide a unified delivery platform enabling enterprises to couple cloud computing with application and desktop virtualization to realize the combined resource optimization, infrastructure agility and economic benefits of a single platform. AppEnsure correlates end user experience with the application delivery infrastructure performance, providing IT Operations with unique Application Operational Intelligence to prevent Citrix delivery slowness affecting user productivity. AppEnsure empowers IT Operations to

proactively anticipate, troubleshoot, resolve, and prevent performance issues in the most complex Citrix XenApp and XenDesktop environments.

Ability to prevent application performance issues before business users are impacted – AppEnsure enables you to be proactive in managing the quality of the end user experience of enterprise applications. The quality of the end user experience could lead to revenue loss if it impacts employee productivity.

Instant value to IT Operations - AppEnsure automatically discovers, with zero manual configuration, all the applications in the customer's environment, names them, maps their topology across all the tiers of the application stack, and then in real time and on a continuous basis, measures their end-to-end response time and throughput. These automatic processes provide instant visibility of end user experience, also often discovering unknown applications.

Breadth of applicability – Deliver the ability to optimize performance for *every* application. AppEnsure helps manage every Windows and Linux application, including both custom developed and purchased applications (in general, 90% of the applications that customers run are purchased). It also provides the ability to follow applications as they migrate:

- from physical hardware to a data center virtualization platform like VMware or Hyper-V
- to private clouds managed by VMware, vCloud Automation Center or OpenStack
- to hybrid clouds hosted by vendors like Terramark or Savvis
- to public clouds like Amazon EC2, Windows Azure and various OpenStack clouds

Automated root cause analysis – using a sophisticated combination of self-learning analytics and dependency rules, AppEnsure automatically tells the administrator which element in the infrastructure supporting the application is causing the degradation in the performance of the application. AppEnsure then proposes actionable resolutions that IT Ops can implement to return the application to the desired performance or required service level.

Differentiators

Whereas traditional tools rely on commodity data available through WMI, WMC and other sources to provide commodity results in estimating the end-user experience, AppEnsure calculates unique metrics – response time and throughput – for every application & VDI accessed by the end-user.

AppEnsure auto discovers the service dependencies of the Citrix farm as well as the back-end infrastructure, continuously monitoring the availability and responsiveness of those services. Any sluggish behavior of the underlying infrastructure components and services are detected in real time, alerting IT Ops of the preventive actions to be taken to ensure the user experience meets expectation and service level.
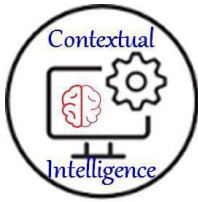
AppEnsure develops baselines for response time and throughput based on the time, day, week and month. This contextual intelligence provides understanding of the user experience for each application and VDI, empowering IT Operations to architect the deployment to optimize business productivity.

AppEnsure supports any application, any delivery and any application deployment (on premise or cloud based). AppEnsure supports:

- Web applications, virtually delivered applications, Vendor Software such as SAP or Microsoft Exchange and Custom developed.
- Synchronous, Asynchronous and Batch Processing applications.
- Applications written in any programming language.
- SaaS applications that are part of workload.

AppEnsure requires zero configuration to automatically discover applications. As end users access the applications, AppEnsure auto discovers the end users and applications and start building the repository of applications and its users. AppEnsure supports middleware servers like Apache Active MQ, IBM MQ and Rabbit MQ.

Solution Basics

One of the main challenges today for data center management is extracting the necessary data from the vast amounts of data collected. In surveys of mid-sized enterprise data centers there are on average between 30 and 50 APM tools in use, each usually providing its own dashboard. The real challenge is how to correlate all the data and dashboards in real time to extract real intelligence from these metrics and authenticate it. AppEnsure automatically gathers information from all the sources to which it has access, including broadcast metrics, in addition to building the unique metrics from the derived flow intelligence without any human intervention in this process. Then, it correlates all the relevant data to create the actionable intelligence specific to the target application.

The AppEnsure product consists of two components: Master and Agents.

The AppEnsure Master is provided as a virtual appliance or as standalone which stores and presents data from the agents. A web browser is used to access the AppEnsure Console through the Master. AppEnsure strongly suggests that you install the Master on a dedicated

machine (virtual or standalone) for adequate stability and performance.
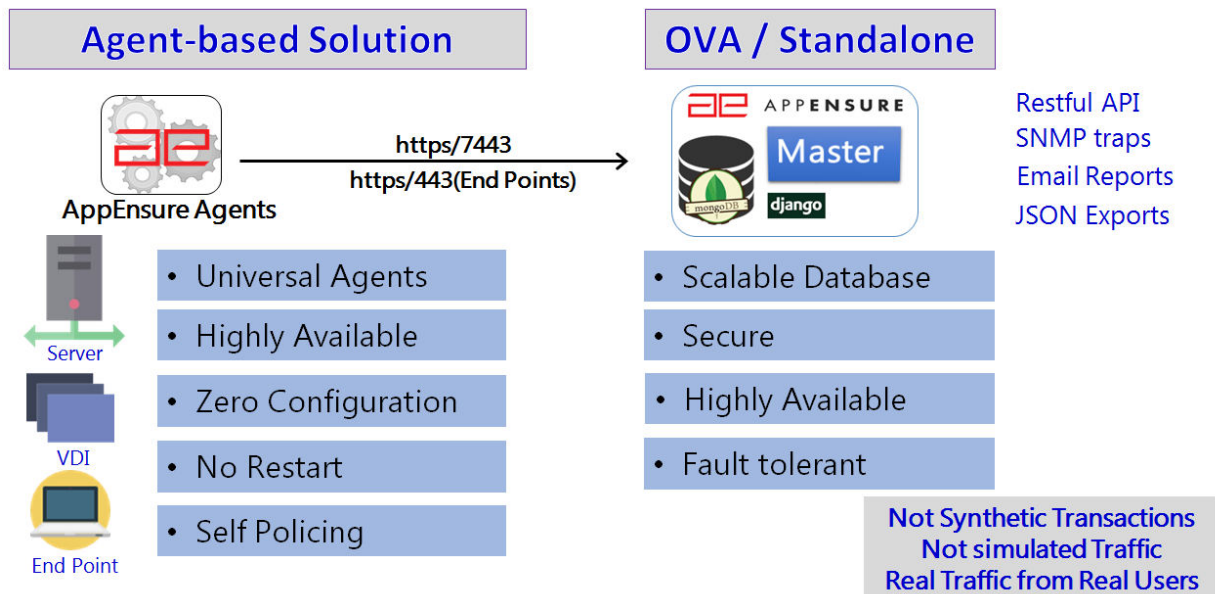
Unique Metric – Response time for every transaction

AppEnsure calculates the response time for every application irrespective of the delivery mechanism (Citrix and Non-Citrix) for every user that is accessing the application. The response time is calculated for every call made by the user to the application. A call is a request from a unique user of an application. The call response time is calculated at the TCP layer. For every request from the user, a connection is established and the connection remains until the request is completed. A termination of request is considered as a call. In persistent connections, each request is identified within that persistent connection uniquely. Response deviations for any user from the baseline are a clear indication of degradation of end user experience. AppEnsure's Diagnostics engine performs diagnostics at multiple levels to determine the root cause of such deviations.

AppEnsure has full network stack visibility from layer 3 to layer 7. This is how AppEnsure builds the topology map and can follow all transactions through the stack from end to end. AppEnsure performs deep packet inspection at layer 3, opening every packet, header and payload, extracting the key information showing the path of the transaction. It also looks up to layer 7 to extract the key 'conversational' data to allow us to understand the application's interaction and build a workflow. While there may be many thousands of different transaction flows between an application and the infrastructure, AppEnsure can differentiate the application flows and map them contextually. AppEnsure accomplishes deep packet inspection *without* terminating any connections at wire speed as packets are transiting through the workload.

AppEnsure's Auto Discovery Features

AppEnsure supports all types of applications:

- Web applications, virtually delivered applications, Vendor Software such as SAP or Microsoft Exchange and Custom developed
- Synchronous, Asynchronous and Batch Processing applications
- Applications written in any programming language
- SaaS applications that are part of the workload

Zero Configuration

AppEnsure's auto discovery features requires no additional configuration. AppEnsure discovers applications and maps topology upon installation based on new transactions that are directed towards the applications from the users. The only requirement is that the installation of the AppEnsure agents for application workloads must start from the presentation tier. For example, for web based applications, the agent should be installed on the web servers that receive requests from the users. In the case of Citrix environments agents must be installed first on the Desktop Delivery Controllers (DDC). There is no requirement to restart the servers after installing the agents.

Discover Applications

AppEnsure uniquely and automatically discovers every Windows and Linux application in your environment, identifies it by name, and measures the end-to-end and hop-by-hop response time and throughput of each application. This works for applications installed on physical servers, applications installed in virtualized guest operating systems, applications automatically provisioned in private or hybrid clouds, and applications running in public clouds. It also works irrespective of whether the application was custom developed or purchased.

Discover Multitenant Applications

On a logical web server like IIS, Apache or WebSphere, multiple applications can be installed differentiating by the URIs. AppEnsure auto discovers multitenant applications hosted on web servers and does not limit the discovery to the logical server level.

Discover Multiple Instances of Application

It is a common practice for enterprises to service all of its end users in the most responsive way, by running multiple instances of the same application load balanced amongst the instances. For example, it is quite common to have multiple Microsoft Exchange servers for servicing Email. Business critical applications may have multiple web servers front ending to receive requests to be serviced from the end users. AppEnsure auto discovers multiple

instances of the same application and present them all as a group with the ability to drill down to the details of each instance of the application.

Discover SaaS Applications

AppEnsure auto discovers any requests directed to SaaS applications such as Office365 or Salesforce and calculates response time and throughput to these applications from the enterprise.

Discover Virtually Delivered Applications or Desktops

AppEnsure provides extensive support for Citrix delivered applications or desktops. AppEnsure automatically maps the topology of the delivered applications and VDIs, hop by hop and end to end. This visibility extends beyond the Citrix farm into the back-end infrastructure on which the delivered applications and VDIs are supported.

Discover Application Workload Topologies

The AppEnsure architecture auto discovers application flows mapping topology and user response times from these flows to create the application topology and update that topology in near real time as changes occur—all without user configuration. This allows for excellent "out-of-the-box" support for applications, including custom applications. These capabilities significantly reduce the resources required to configure service models and operate the product.

Measure Application Workload Performance

AppEnsure delivers an Enterprise view of all Applications running; legacy, custom & purchased in all locations; physical, virtual, private & public cloud. This is a dynamic view that will update in real time to show all instances with their respective response times. The overall throughput of all instances of an application delivers a deterministic demand load profile, not an inferred one from resource utilization. Measure and manage app performance!

AppEnsure provides visibility for each instance of Applications running, by server, with the specific performance data for each instance. This measured data allows the combination of application performance and server performance, for overall instance performance. As alarms are flagged, AppEnsure will, in real time, discover the baseline for normal performance and, when deviations occur, display the root cause and proposed remedy to return the instance to the normal performance or the desired Service Level.

Discover Every Tier of Every Multi-Tiered Application

AppEnsure auto discovers the different tiers for every multi-tiered application and provides the performance of each tier. This allows for excellent "out-of-the-box" support for applications including custom applications. AppEnsure automatically maps the virtual and physical topology of each application to give clear visibility of all transactions through all

tiers of the application and infrastructure. Each tier is discovered and named with the transactional throughput and response times shown for each tier. If there is an alarm for slow response time, the segment with extended latency will be clearly visible in the end to end transaction flow.

Discover All Users of All Applications

AppEnsure identifies every user of every application and the response time experience that the user is having for each use of a given application.

Discover Anomalies with Applications

As deployed, AppEnsure uses a sophisticated anomaly detection algorithm to automatically assess when a response time excursion is valid, then if a response is seen to exceed normal baseline or SLA performance expectations, deep diagnostics are triggered to analyse the event. In addition, the hop by hop segment latency is compared against the historical norms to identify deterministically which segment has extended latency and reduced application performance.

Baselining

The responsiveness of the application determines the end user's experience. In order to understand the end user's experience, contextual intelligence on how the application is responding based on the time of the day, the day of the week, the week of the month and the month of the year must be measured. Baselining requires capturing these metrics across a time dimension. The base line of response time of an application at regular intervals provides the ability to ensure that the application is working as architected. It is more than a single report detailing the health of the application at a certain point in time.

"Dynamic baselining" is a technique to compare real response times against historical averages. Dynamic baselining is an effective technique to provide meaningful insight into service anomalies without requiring the impossible task of setting absolute thresholds for every transaction.

A robust user experience solution will also include application and system errors that have a significant impact on the ability of the user to complete a task. Since the user experience is often impacted by the performance of the user's device, metrics about desktop/laptop performance are required for adequate root-cause analysis.

For example, when you collect response time within an Exchange environment over a period of time with data reflecting periods of low, average, and peak usage, you can make a subjective determination of what is acceptable performance for your instance. That determination is your baseline, which you can then use to detect bottlenecks and watch for long-term changes in usage patterns that require Ops to balance infrastructure capacity against demand to achieve the intended performance.

When you need to troubleshoot system problems, the response time baseline gives you information about the behaviour of system resources at the time the problem occurred, which is useful in discovering its cause. When determining your baseline, it is important to know the types of work that are being done correlated with the days and times when that work is done. This provides the association of the work performed with the resource usage to determine whether performance during the measured intervals is acceptable.

Response time baselining helps you to understand not only resource utilization issues but also availability and responsiveness of services on which the application flow is dependent upon. For example, if your Active Directory is not responding in an optimal way, the end-user experiences unintended latencies with the application's performance.

By following the baseline process, you can obtain the following information:

- What is the real experience of the user when using any application?
- What is "normal" behaviour?
- Is "normal" meeting service levels that drive productivity?
- Is "normal" optimal?
- Are deterministic answers available?
    - Time to close a ticket, Root cause for outage, Predictive warnings, etc.
- Who is using what, when and how much?
- What is the experience of each individual user and groups of users?
- Dependencies on infrastructure
- Real-time interaction with infrastructure
- Gain valuable information on the health and the capacity limits of the hardware and software that is part of the application service delivery chain

Real-Time End User Experience

AppEnsure identifies every user of every application and measures response time collectively for all users as well as for each user. AppEnsure measures the end user experience (EUX) in terms of response time and throughput to manage application performance. Uniquely, AppEnsure correlates EUX with the application delivery infrastructure performance providing IT Operations with the needed Application Operational Intelligence to manage service levels that maximize enterprise productivity and revenue generation. By measuring the end-to-end response time of real (not synthetic) transactions through the entire stack, AppEnsure provides contextual, actionable intelligence to reduce the resolution of application brownouts and blackouts.

End-to-End Visibility

In addition to the server agents, AppEnsure also utilizes endpoint agents. Endpoint agents allow you to view application performance from the end user perspective of their access to

the application from the endpoint. The end user and application views are sent back to the Master for event correlation, root cause analysis and resolution proposal.

When endpoint agents are installed, detailed visibility of what applications the end user is accessing and how they are responding to the user is provided with bifocal visibility – as seen from the server as well as seen from the end user side. In addition, typical end device metrics like CPU utilization, memory, disk and network usage are collected.

The following picture illustrates the response time measured by AppEnsure when endpoints are instrumented with AppEnsure agents.
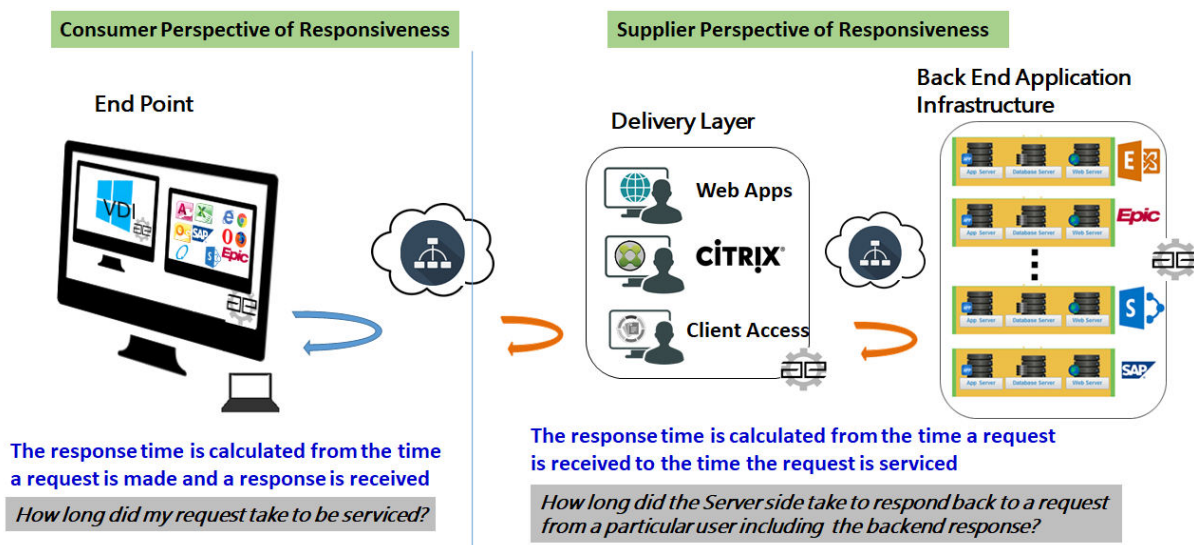
Installing agents in the endpoints is optional. If an endpoint agent is not present, only the server side perspective of response times for each request is available.

AppEnsure, with its contextual Application Operational Intelligence measuring end-to- end response time-based service levels, uniquely correlates the application delivery view with that of the end-user. AppEnsure relies on real transactions (not synthetic) to provide actionable intelligence. This empowers our customers to proactively anticipate, troubleshoot, resolve, and prevent performance issues in the most complex Citrix XenApp and XenDesktop environments.

AppEnsure provides:

- True end-to-end visibility beyond the Citrix silo
- Auto correlates each user's access to backend infrastructure
- Backend response time for each user for every application accessed
- Response time and latency measured through the delivery layer
- Endpoint agents further identify network latencies or endpoint issues


Diagnostics

When an event occurs, AppEnsure automatically correlates across all related (and unrelated) threads to look for correlating events. This is a major part of the analysis for root cause. These mappings and correlations are updated automatically in a dynamic environment as applications are spun up or down.

As deployed, AppEnsure uses a sophisticated anomaly detection algorithm to automatically assess when a response time excursion is valid, then deep diagnostics are triggered to analyze the event.

In addition, the hop-by-hop segment latency is compared against the historical norms to identify deterministically which segment has extended latency and reduced application performance.

Based on many thousands of stored instances and rules, which are continually being incremented by machine learning, the root cause analysis of an event can be deterministically established. This triggers a proposed remedy for IT Ops to restore service to the Desired Service Level.

An AppEnsure generated alert is a notification that an event occurred. Alarms are generated by AppEnsure when a set of related alerts are correlated and a potential root cause for the alerts can be diagnosed.
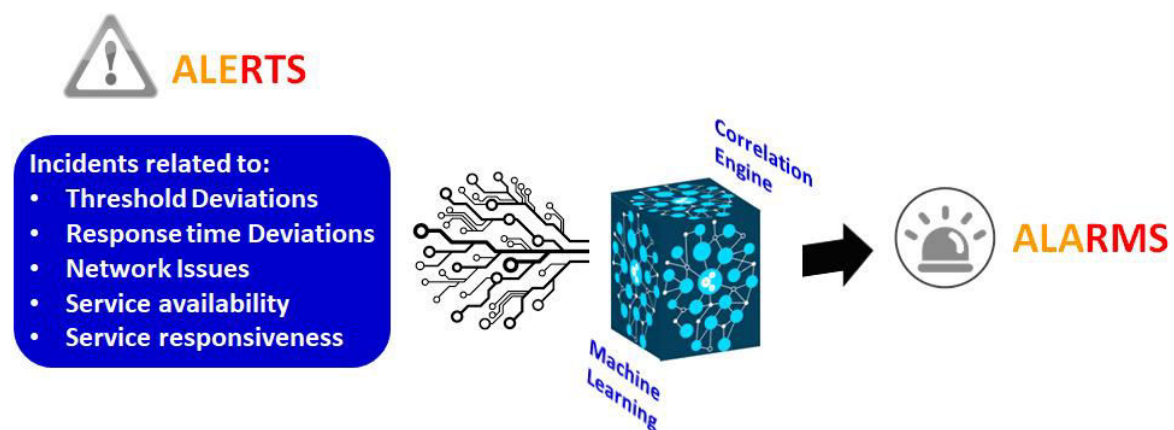
Alerts/Alarms are generated under the following categories:

- Errors – relating to protocol errors
- Network – TCP/IP anomalies observed from Server/Client machines
- Services – External services and Internal service dependencies
- Resources
- Response Time
- Citrix Farm related

- Citrix Session specific
- Citrix delivered Application specific
- Citrix delivered Desktop specific

Features Overview

AppEnsure provides a constant view of the data center ecosystem from an application perspective and monitors its performance. Key features of the AppEnsure product are described below.

AppEnsure presents three views of correlated data: Application Centric View, User Centric View and Resource Centric View

In an executive dashboard with a system-wide summary of every application, users and alarms, AppEnsure gives you an overview of all your applications and how they are performing at a glance.
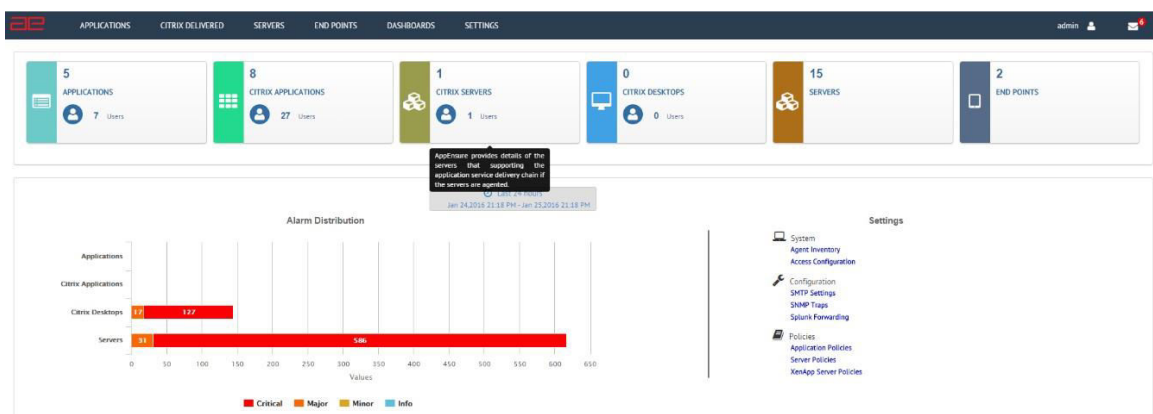
In a dynamic, application topology map highlighting the specific hops deviating from normal behaviour, AppEnsure automatically maps the virtual and physical topology of each application to give clear visibility of all transactions through all tiers of the application and infrastructure.
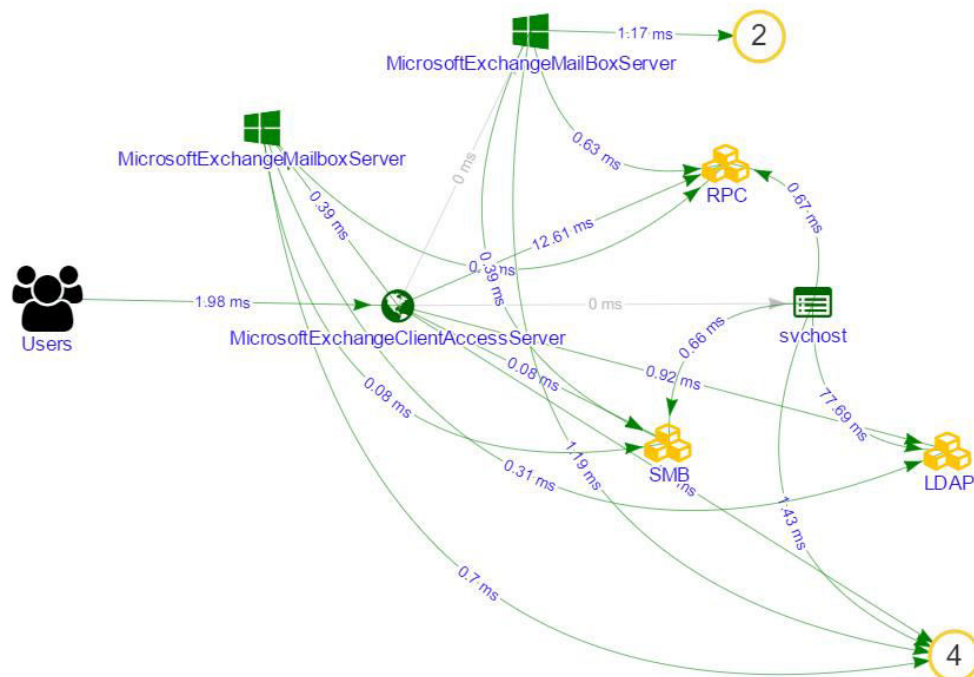
AppEnsure discovers access from your enterprise to any of the well-known SaaS offerings such as the Office365, Google, Salesforce, etc. AppEnsure auto detects transactions to these services and maps those transactions in the topology map along with responsiveness of those services. You can determine if you are getting the desired Service Levels from the SaaS subscriptions that your enterprise is dependent upon.

Similarly, if your application workload is dependent on external services for completing the transactions, you can monitor the service level such services are offering. If the productivity of your organization is dependent on timely transaction servicing and if the transactions are dependent on external services, this feature can help you quickly determine where the bottlenecks are.
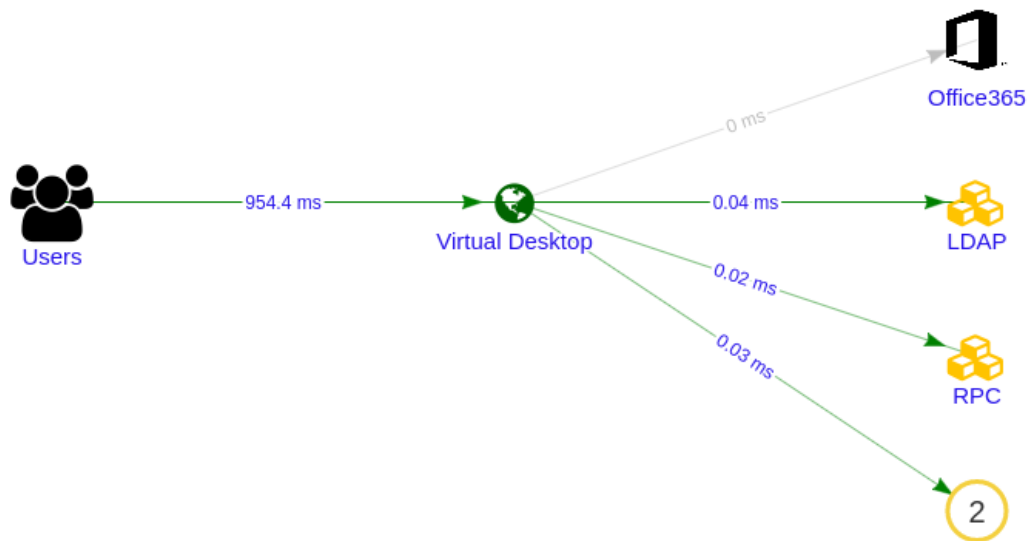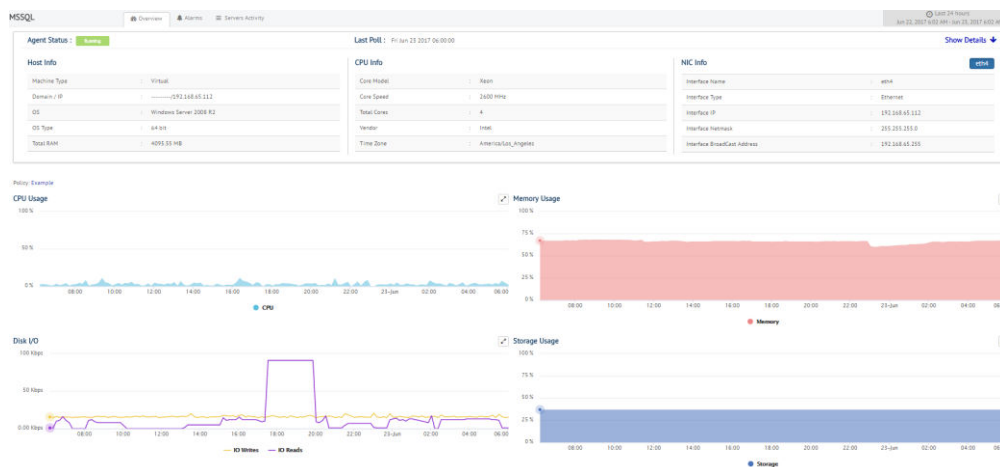
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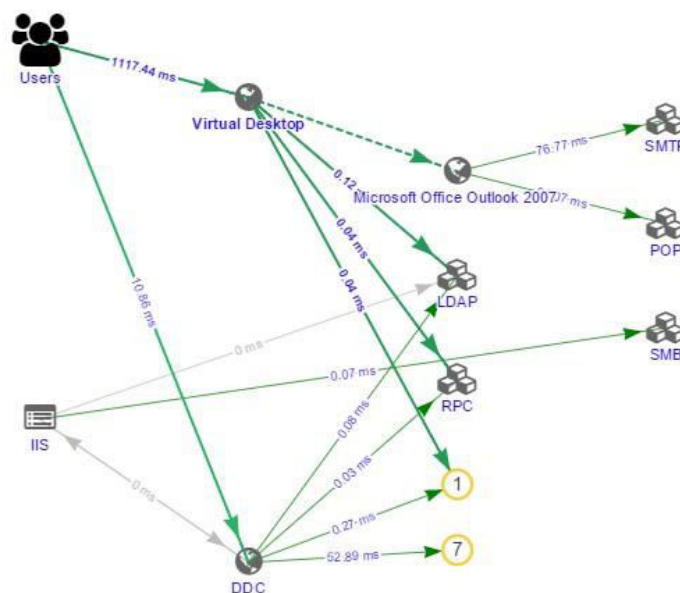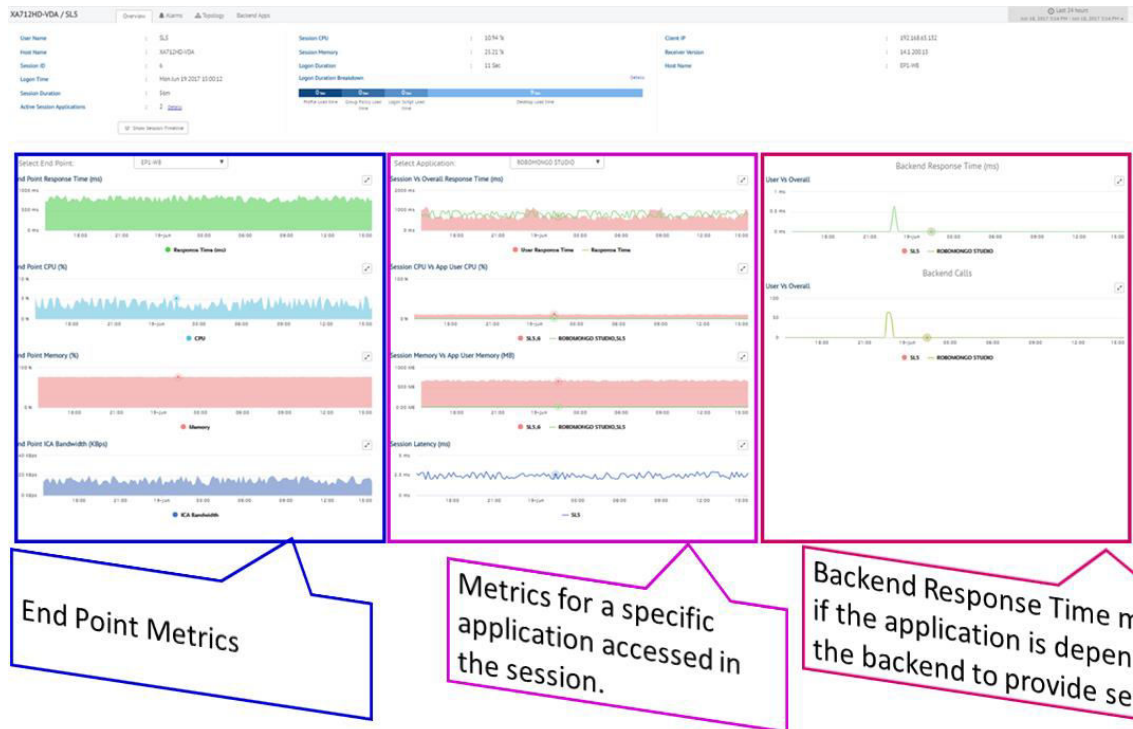

AppEnsure provides visibility into each application running, by server, with the specific performance data for that instance. The data allows the combination of application performance and server performance for overall instance performance. As alarms are flagged, AppEnsure will in real time display the root cause and proposed remedy to return the instance to the desired performance or Service Level.
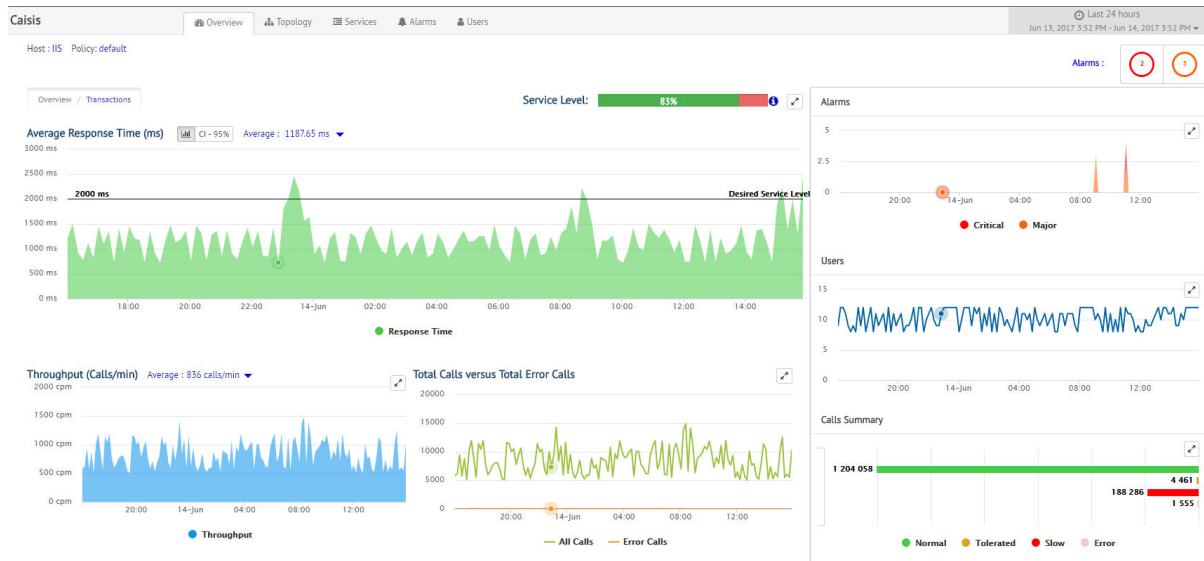
AppEnsure's resource centric view presents the server resource metrics including all the processes running on the server and a breakdown of the resource utilizations of each of the processes. If processes are servicing requests from end users, the responsiveness of the service is also presented.

For Citrix environments, AppEnsure provides unprecedented end-to-end visibility for every application and VDI delivered, in a single pane.

End Point Metrics

Metrics for a specific application accessed in the session.

Backend Response Time metrics if the application is dependent on the backend to provide service.

For Citrix environments, AppEnsure analyzes the logon duration of each session for every user of XA/XD and provides a comparison of the logon process for all sessions that a particular user has previously experienced. If the logon duration exceeds the specified threshold value (auto-baselined or IT Ops specified), diagnostics are performed to determine which particular phase within the logon process has taken a longer time than the set threshold period.
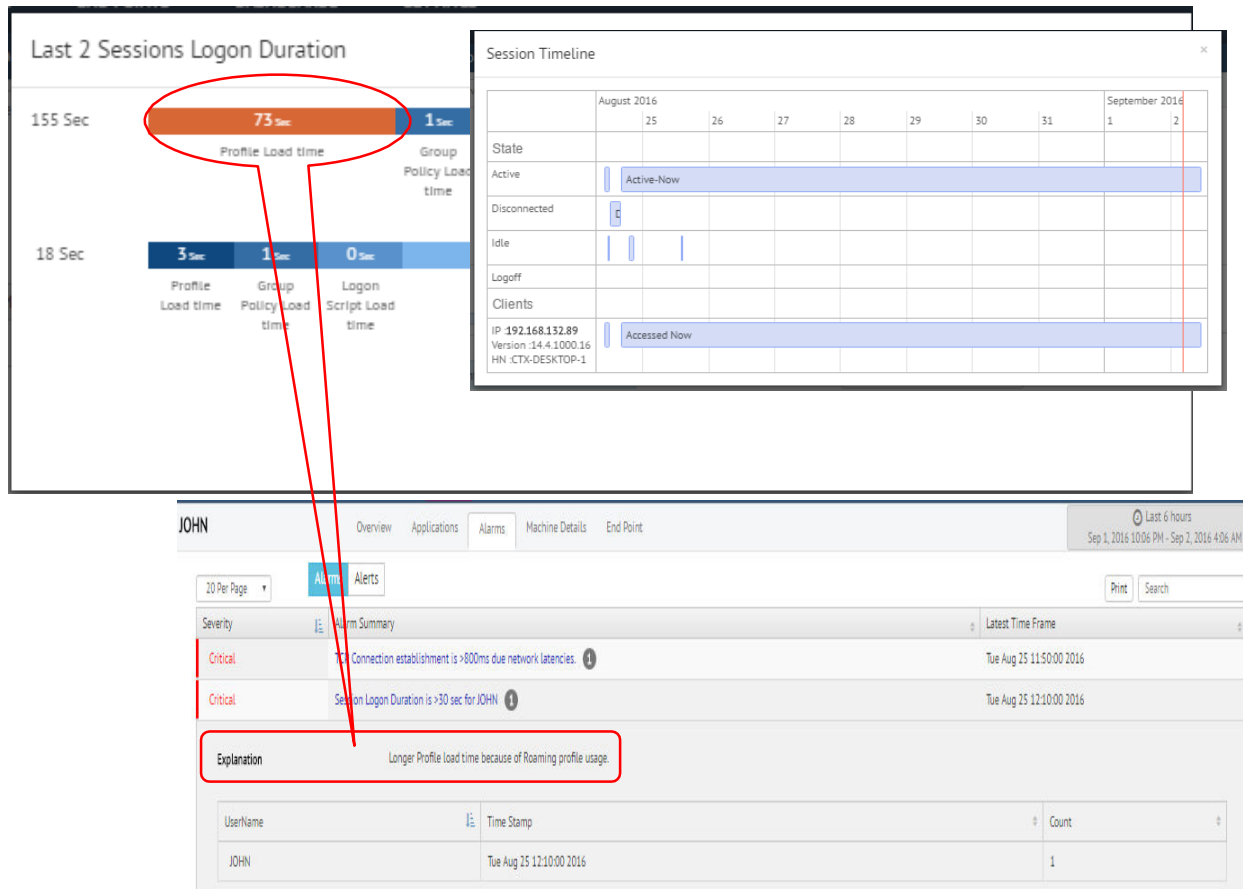
AppEnsure provides a detailed timeline for each session indicating the active and idle periods during each session, for every user. This can be used to proactively review how to improve the user experience through optimizing slower phases and infrastructure responses.

Competitive Analysis

AppEnsure's solution differentiates itself from other competitors in providing true end user experience for every access of every application or VDI. The following table highlights how AppEnsure compares against other monitoring solutions.
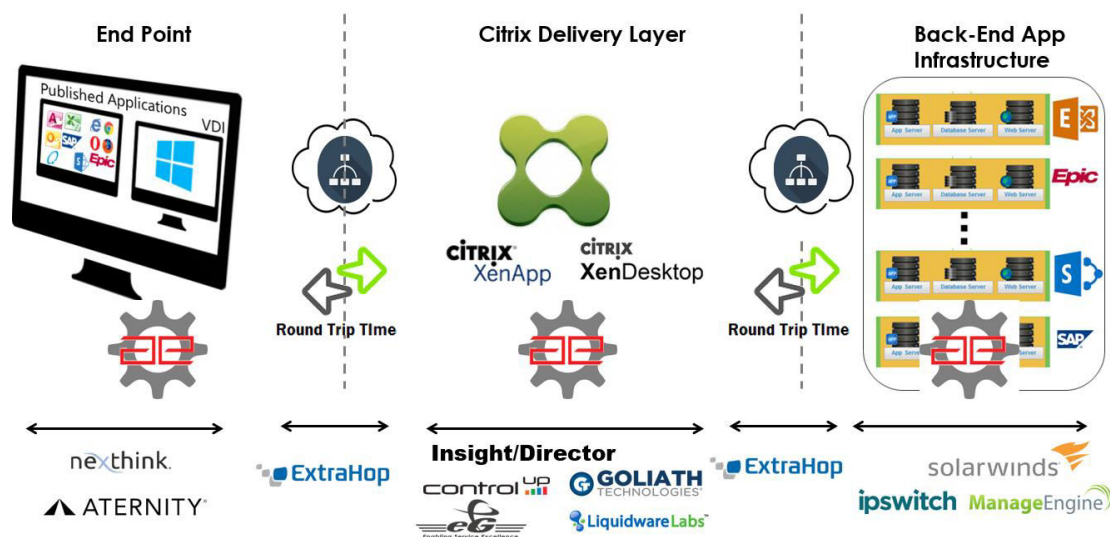
APPENSURE

AP**P**ENSURE	Other Monitoring Solutions

• Does not rely only on commodity data.
   • Determination driven by unique metrics.
	• Rely on commodity data.
	   • Commodity Data = Commodity Results
	   • Interpreted from resource utilizations.

• Correlates & Monitors all dependent & child processes with response times if communicating. For all servers in supply chain.	• No correlation. In few cases, just identifies all processes for Citrix silo only. Manual inspection of each process is needed.
• Auto discovers all dependent services. • Monitors for availability and responsiveness.	• Does not monitor dependent services. In some cases only monitors availability only.
• Auto discovers applications, VDIs, users, topology. Zero configuration.	• Configuration required and no auto discovery in most cases.
• No server restart.	• Requires server restart in most cases.
• Alarms with auto diagnostics and root cause.	• Alarms and root cause requires manual interpretation of data.

In Citrix environments AppEnsure provides end-to-end visibility and performance analysis from a single interface. In contrast, to gain the same single pane visibility and knowledge that AppEnsure provides for managing Citrix deployments end-to-end, multiple other 3rd party tools are required (as shown in the picture below).

Scalability

AppEnsure supports both horizontal and vertical scalability to support an unlimited number of Agents to communicate with the Master controller. The horizontal scaling (scale in/out) is accomplished by adding more collecting points to feed Agent data to the Master. The vertical scaling (scale up/down) is accomplished by adding more resources to the Master.

Based on the specific monitoring requirements of a given implementation, either or both scaling options should be architected to meet the specific operating objectives while implementing the AppEnsure solution. AppEnsure is designed to scale well to be able to maintain the levels of performance and efficiency required for Enterprise operational demands.

Conclusion

With today's agile development tools, applications are no longer monolithic chunks of code as they were in the past but are broken into multiple elements that run on various servers to complete a workload. Any one of these applications can become the point of failure or sluggishness for a transaction, which results in abandoned transactions leading to revenue loss.

Application performance management and engineering for the application tier and the storage tier is where the complexities are involved and requires a unified approach that is non-existent in other management tools. AppEnsure focuses on providing solutions that deliver unified relational visibility of all tiers of the environment in both application and infrastructure, but from the end user and application perspective. Without this bi-directional view, it is difficult, if not impossible to see where all events are occurring in real time.

Many solutions in the APM space collect information and provide the capability of monitoring the resource usage, usually as snapshot measurements periodically. This can be, for some tools, as often as every five seconds, but for many complex tools, it can be as little as every two minutes otherwise the processing burden is so intense it degrades the production performance considerably. This snapshot information without the context of all other metrics cannot provide a full analysis for fast and accurate problem resolution.

AppEnsure delivers the full behavioural profiles of both application conversations and calls and infrastructure responses and performance which is critical to understand fully what the overall performance is based upon.