

Applied Analytics Overview

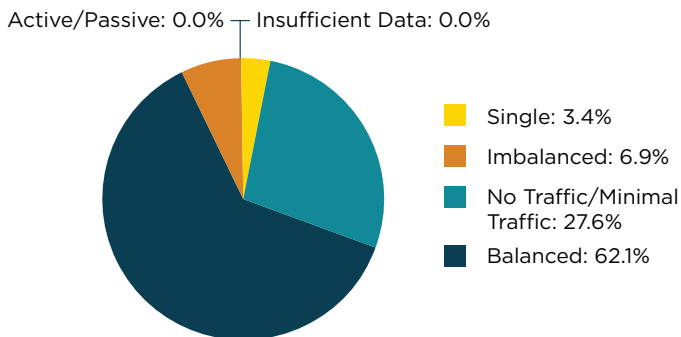
VirtualWisdom® Applied Analytics Subscription

Turning data into answers. In the world of IT, there is planned work or unplanned work, and the two exist like matter and anti-matter. An unplanned outage will derail the most well-intentioned scheduled activities and bring planned work to a halt. Whether your activities skew more toward delivering on net new, maintaining existing, or reducing accumulated technical debt, you need better answers to shape decisions. VirtualWisdom's pedigree is rooted in reducing the unplanned work while dramatically increasing the planned. Our Infrastructure Performance Management (IPM) platform collects data from the instrumented environment and performs complex, multi-variate analysis that removes bottlenecks in the system, accelerates the flow of work in the organization, and creates a stronger final product. This makes teams more effective and promotes systems that bring higher value.

With Applied Analytics, we've taken the expertise gained from working with hundreds of enterprise clients and built that wisdom right into the platform. The analysis that used to take experts hours or even days is now executed in seconds.

- Have to verify load balancing across your hosts? Use Balance Finder.
- Need to find out if any deviations require attention? Use Event Advisor.
- Want to understand causality between trends? Use Trend Matcher.
- Need to understand impact of I/O queue depths across hosts? Use Queue Solver.
- Want to better align virtual workloads to underlying servers? Use VM Coordinator.
- Need to identify the optimal cluster and host to deploy a VM on while maintaining optimal performance and balance? Use VM Deployment Advisor.

Load Balance Mix



Applied Analytics focuses on the critical findings that exist beyond your raw data. The Applied Analytics module is delivered on a subscription basis, specific to the scope and scale of your unique VirtualWisdom implementation. This licensing model provides customers with all the standard analytics (Balance Finder, Event Advisor, Trend Matcher, Queue Solver, VM Coordinator, VM Deployment Advisor, Seasonal Trend, and Workload Analysis). It also ensures that, as these analytics evolve, and new ones are added, you can immediately benefit.

Applied Analytics deliver the authoritative insights and consistency you need to maintain agility and sustain your competitive edge.

Actionable insights delivered by Applied Analytics

Balance Finder

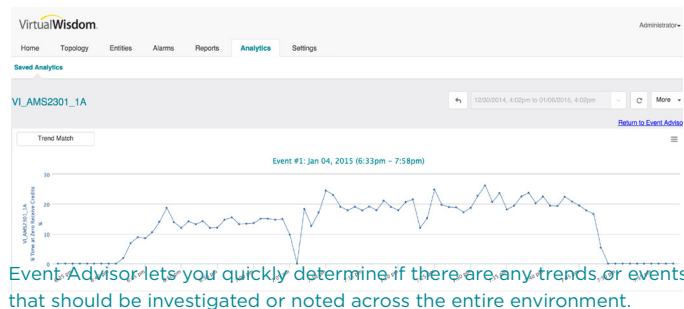
Balance Finder actively measures traffic patterns in the environment to determine if they are optimally balanced across host connections. The goal is to make sure that the host workload and the associated traffic is appropriately balanced across the environment. With Balance Finder, the VirtualWisdom platform automatically determines if the environment is balanced or imbalanced, if it is setup for active/passive connectivity, and tracks indicators of any change in the balance of an environment.

This enables the ability to validate available capacity in the event of a path or component failure in the environment—mitigating risk and optimizing resource utilization.

Using Balance Finder, you can generate a balancing report for your entire environment in a matter of seconds. This report provides the percentage of infrastructure that is balanced, imbalanced, active/passive, and identifies any single points of failure. It also provides this information as a comprehensive list that includes every server, so you can quickly see the balance of workload by server and port.

Finally, from this baseline, the system automatically notifies you of any changes. For example, if some servers were balanced in the past but are currently imbalanced, perhaps from a change in workload, both the prior and current state are presented in the user interface. Additionally, you can instantly see a trend chart for any HBA to understand when the risk was introduced into the environment.

This is the very essence of Balance Finder—to very quickly give you visibility into areas of risk, and opportunities for optimization, and to alert you to changes that require immediate attention—so that you can take action and ensure you won't have any issues over time.



Event Advisor

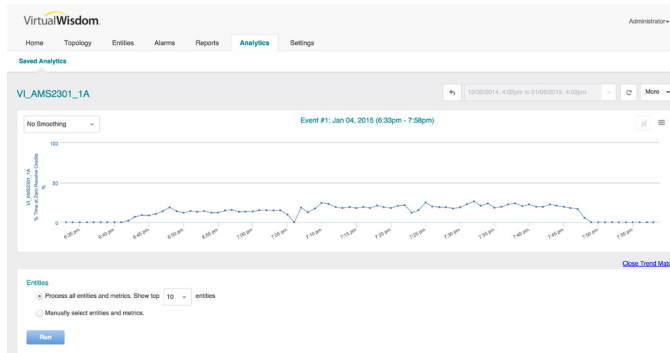
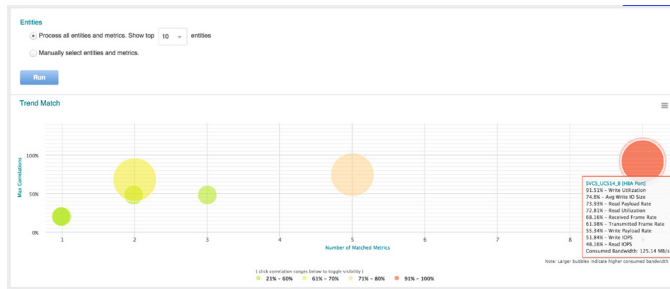
Event Advisor enables you to specify a given metric or set of metrics, and “ask the platform” if there are any trends or events that should be investigated or noted across the entire environment. Simply specify a timeframe and Event Advisor provides a list of potential events, and the associated entities and metrics—all ranked by magnitude and duration. This provides a prioritized list of relevant issues for investigation in seconds, instead of requiring you to look through every device and timeframe manually searching for anomalies.

In most cases, Event Advisor is used in conjunction with Trend Matcher. For example, if you have a mission-critical application entity that appears to be suffering from performance degradation, historically finding the root cause has been a manual, time and resource intensive process. Instead of searching for the answer, you can ask Event Advisor to look across the environment for any changes in the performance metrics that indicate potential performance impacting events.

Trend Matcher

Trend Matcher takes a source trend, either identified by the user or by the Event Advisor, compares the trend with every entity in the database for the timeframe specified, and provides a list of suspect entities or devices sorted by correlation, number of metrics, and workloads. This enables the user to

identify the probable source of a recognized event, and the other entities that might also be affected.



Trend Matcher enables you to identify the probable source of a recognized event and the other entities

Trend Matcher works in conjunction with Event Advisor. A common example where these analytics deliver significant value is in the case of slow draining devices. In this case, Event Advisor quickly and automatically identifies areas where buffercredit starvation is happening—which is a primary indicator of a slow drain. Trend Matcher then quickly and accurately identifies the most probable source of the slow draining device—in many cases an unrelated and misbehaving host that cannot keep up with the data it is requesting—resulting in broad performance degradation in the shared environment.

Seasonal Trend Advisor

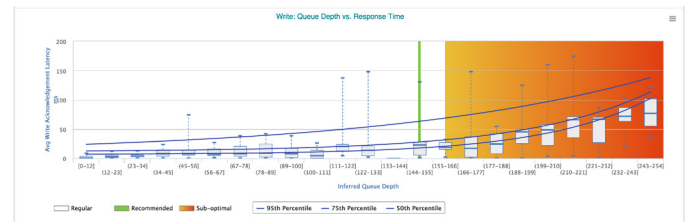
Setting thresholds and alarming is too cumbersome to manually do. This new analytic learns from “seasonal” business patterns—whether a season is hourly, daily, weekly, monthly, quarterly, yearly, etc. With it, customers can set multivariate thresholds, and make tuning adjustments on-the-fly via data-informed prediction of resource needs. Its primary benefit is that it detects variances above or below established thresholds, based on the seasonality of business workloads.

How it works: Seasonal Trend Advisor identifies all periodic trends, and builds an observed v expected overlay model so that it can monitor and alarm normal/expected workload states if they go beyond specified standards of deviation. It can run against any and all metrics in the VirtualWisdom platform

– IOPS, I/Os per second, MBs per second, CPU Utilization for ESX, etc.

Queue Solver

Queue Solver examines actual historical host configuration settings (HBA queue depths) and performance data to provide detailed recommendations to optimize the system-wide performance. This allows you to establish server configuration settings based on application-specific historical data instead of guesses or rules of thumb. The Queue Solver analytic can be used to build and tune server configuration standards over time.



Queue Solver enables you to quickly identify the queue depth setting that optimizes performance

Performance degradation problems caused by host configuration issues are both very common and can be extremely difficult to troubleshoot because the system is not in an errored state. This analytic can be used in conjunction with Event Advisor and Trend Matcher to not only identify the problem, but provide detailed recommendations on how to optimize the system-wide performance.

VM Coordinator

VM Coordinator provides accurate guidance on the optimal placement of virtual machines across clusters before degradation occurs, and helps eliminate over-provisioning and unnecessary rebalancing.

VM Coordinator examines historical resource usage for every VM host across the estate and determines how best to organize the environment. The analytic presents performance improvement projections for every forecast it makes, as well as providing a script that can deliver the migrations. This delivers an experience that aligns virtualized workloads to infrastructure assets with higher fidelity than what is currently available.

VM Deployment Advisor

This analytic works in conjunction with the VM Coordinator and identifies the optimal cluster and host to deploy a VM, based on available capacity and expected VM workload across CPU, Memory, I/O and Network.

Deployment Advisor finds which ESX, Hyper-V,

or PowerVM hosts are overloaded. If so, run VM Coordinator to rebalance the workload.

Seasonal Trend

The Seasonal Trend Analytic offers a data-informed prediction of resource needs within seasonal business patterns, by entity, by hour, day, week, month, quarter or year. This dramatically reduces false alerts, ensuring that actual problems are not ignored, as is often the case with simpler rules based alarms.

Workload Analysis

Workload Analysis transfers production workload modeling data to LDX-Enterprise, enabling the most hyper-realistic storage testing and validation possible today.

Environment-Specific Subscription Model

VirtualWisdom Applied Analytics are available via an annual subscription model. This licensing model provides customers with all the standard analytics mentioned. This approach ensures customers have immediate access to any enhancements made in the existing analytics, as well as a seamless method for licensing additional analytics as they become available.

The pricing for the analytics subscription is based specifically on your existing VirtualWisdom deployment. This ensures that you get exactly what you need for exactly what you have, based on your unique VirtualWisdom environment.



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