



INDUSTRY TRENDS PERSPECTIVE

LEGACY, SOFTWARE-DEFINED, VIRTUAL, CLOUD AND CONVERGED INSIGHT

INTRODUCTION

This Server StorageIO® Industry Trends Perspective Report looks at the value of data center infrastructure insight both as a technology as well as a business productivity enabler. Besides productivity, having insight into how data infrastructure resources (servers, storage, networks, system software) are used, enables informed analysis, troubleshooting, planning, forecasting as well as cost-effective decision-making. In other words, data center infrastructure insight, based on infrastructure performance analytics, enables you to avoid flying blind, having situational awareness for proactive Information Technology (IT) management. Your return on innovation is increased, and leveraging insight awareness along with metrics that matter drives return on investment (ROI) along with enhanced service delivery.

HIGHLIGHTS AND SUMMARY

Similar to how a traditional factory transforms material and components using different tools, technologies, and processes housed inside a facility, data centers, and their data infrastructures (e.g. information factories) enable a similar capability. While the goods and services delivered differ between traditional, and information factories, what is common across them are having insight, metrics and awareness enabling productivity.

Data infrastructure insight benefits and takeaways:

- Informed performance-related decision-making
- Support growth, agility, flexibility and availability
- Maximize resource investment and utilization
- Find, fix and remove I/O bottlenecks
- Puts you in control in the driver's seat

A key requirement for enabling insight is having access to metrics that matter, along with awareness of application Performance Availability Capacity Economic (PACE) characteristics and resource needs. Continue reading in this StorageIO® Industry Perspective on how Virtual Instruments performance analytics can address data infrastructure, application and storage challenges.

ENABLE DATA INFRASTRUCTURE INSIGHT

Having insight and awareness (e.g. instruments) allows you to avoid flying blind, enabling smart, safe and informed decisions in different conditions impacting your data infrastructure.

How is your investment in hardware, software, services and tools being leveraged to meet given levels of services? Is your information factory (data center and data infrastructure) performing at its peak effectiveness?

How are you positioned to support growth, improve productivity, remove complexity and costs while evolving from a legacy to a next generation software-defined, cloud, virtual, converged or hyper-converged environment with new application needs?

Learn more about gaining insight into, validating, assessing and monitoring IT infrastructure via performance analytics at www.virtualinstruments.com.

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The Value of Infrastructure Insight – Enabling Informed Decision Making

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BACKGROUND AND INDUSTRY TRENDS

All applications have some amount of Performance, Availability, Capacity and Economic (PACE) attributes that vary. Everything is not the same across different organizations, data centers and even applications. However, there are similarities that can be learned and leveraged to avoid treating everything the same.

Fast applications need fast data infrastructures including servers, networks, and storage configured for optimal PACE. To enable optimization, do you have timely accurate insight and awareness into your data infrastructure, or are you flying blind? Flying blind means that you lack proper instruments, impacting confidence, and control to make decisions without situational awareness of your current or soon to be status.

In other words, you could be headed for unplanned performance degradation problems or worse.

Do you have data infrastructure insight into how and where:

- Your application and resource bottlenecks are,
- Flash SSD and NVMe technologies speed up applications
- Bottlenecks will move to new locations with upgrades
- Availability (or lack of) impacts application productivity
- Performance degrades during recovery or failure modes
- Workloads impact performance and availability
- Application changes behave when deployed in production
- Productive resource usage vs. overhead and costs
- Additional resources needed (forecasting) and when

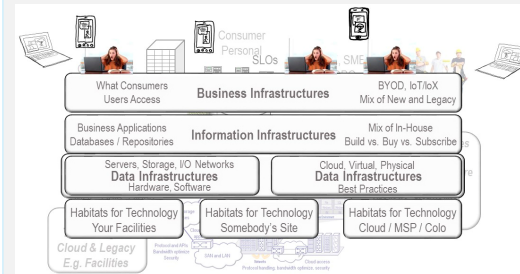
Do you have accurate, timely insights into your data infrastructure performance and associated application growth and resource needs to address the above among other questions, or, are you flying blind? Do you have to make best guesses or “guesstimate” decisions based on what you know or can find out? Perhaps you have some insight and awareness into your environment. However, you can still benefit from additional automation along with timely proactive access to metrics that matter to keep you in control, enabling agility.

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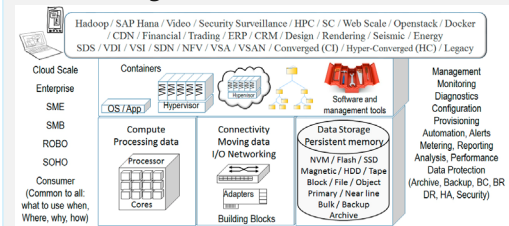
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DATA INFRASTRUCTURES

Data infrastructures support business and organization applications that users rely upon for IT and Information Services.



The core components of data infrastructures are servers, networking, storage, software, services, tools, policies, best practices for legacy physical, software defined, virtual, cloud and converged environments.



To avoid flying blind (remain in control, having situational awareness, enabling informed decision making) requires timely, accurate and relevant situational awareness. This means having insight into your data infrastructure and application workload performance. Additional ways to think about lack of insight for enabling informed decisions is garbage-in information can result in garbage-out decision making. Or, measure twice cut once, buy right vs. having to buy twice.



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DATA CENTER, DATA INFRASTRUCTURE AND COMMON APPLICATION CHALLENGES

Performance depends on availability; availability relies upon performance to support processing, movement and storing of data along with associated applications. The cost of hardware continues to decrease. However, more of it is needed (servers, storage, networks) to support growth, new applications along with software defined data infrastructures.

There is a tendency to focus on physical capital costs such as hardware, networking and facilities. However, there are also opportunities to optimize operational expenses. Besides staffing, maintenance, and services fees, are you getting the maximum value and ROI out of your software? For example, are you getting the highest utilization and effective productivity out of your Citrix, Cisco, Dell/EMC, EPIC, HP, IBM, Microsoft, Oracle, SAP, SAS and VMware among other software investments?

IT, Service Provider (SP) and Cloud data centers are habitats housing data infrastructure (servers, storage, networks, hardware, software, and applications) also known as information factories. These technologies are defined to support various business applications that transform data into information services.

Similar to a traditional factory that transforms material and components using different tools, technologies, processes housed inside a facility, data centers and their data infrastructure (e.g. information factories) enable a similar capability. While the goods and services that are delivered differ between traditional, and information factories, what is common among them is having insight and awareness.

Factories rely on insight and metrics to know if resources are being used cost effectively (productive) and efficiently (eliminate waste, remove costs). Having insight also enables knowing how to reconfigure technology, implement new services and processes, as well as boost productivity and return on investment while improving customer satisfaction.

PACE YOUR APPLICATIONS



All applications require some amount of **Performance**, **Availability** (durable, secure, protected), **Capacity** (space, bandwidth) and **Economics** (**PACE**) attributes. Different application PACE requirements depend on corresponding data infrastructure resource (servers, storage, I/O, hardware, software) needs that must be balanced.

There is no such thing as an information recession, there are budget and economic realities. The result is a balancing act of application **PACE** attributes leveraging insight and metrics that matter, along with awareness of what to do with that information to make informed plans and forecasts along with business decisions.

Key to enabling information factory and data infrastructure productivity, efficiency and effectiveness is to avoid flying blind, having timely insight and awareness into metrics that matter. Metrics that matter are those relevant to your environment enabling application quality of service (QoS) and PACE needs. It's not just about utilization and efficiency, data infrastructures also need to be effective as well as productive.



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Other common data infrastructure and application challenges include:

- Vendors and service providers are often in control telling you what you need and when
- Finding applicable and timely metrics that matter, relevant to your environment
- Assimilating and analyzing disparate metrics and correlating them from various sources
- Simulations, testing and benchmarks are only as good as their input configuration settings
- Poor understanding of how performance and availability is impacted when deploying resources
- Lack of tradecraft skills to know what metrics mean and how to configure for test simulations
- Performance bottlenecks causing availability issues and vice versa
- Reactive versus proactive performance management and tuning throughout perpetual change

NEED FOR DATA INFRASTRUCTURE INSIGHT & AWARENESS

The interdependencies of data infrastructure resources (server, networking, storage, and software) to meet PACE application attributes has resulted in increased complexity (and subsequent costs). The result is the need for timely data infrastructure performance analytics, automation, insight and awareness.

Informed decision-making spans from day to day operational and tactical administration, to strategic architecture, engineering, planning, forecasting and procurement among other tasks. Informed effective decision making by humans or machines requires timely, accurate and relevant insight information. The lack of good information can result in garbage in garbage out decision-making processes. That is, garbage information (or lack of accurate insight) can result in garbage or poor decisions based on incomplete or inaccurate situational awareness.

Having timely, accurate and actionable data infrastructure insight awareness facilitates:

- Timely informed problem resolution, proactive prevention and dynamically adaptive IT agility
- Establishment of performance QoS baselines to know what is normal and abnormal
- Informed collaborative decision making for deployment decisions and configuration optimization
- Maximized investment in data infrastructure resources
- Application productivity performance and availability
- Putting the customer instead of the vendor in control
- Addressing data infrastructure, application and service questions

For example, do you know how well your existing data infrastructure comprising servers, storage and I/O networks are running or being used? Are you meeting target SLA's for response time or productivity metrics? Can you address questions such as how much more performance is needed to support growth in addition to knowing space capacity needs? Do you know what impact different data infrastructure technologies such as faster servers, storage and Non-Volatile Memory (NVM) like flash SSD or NVM Express (NVMe) will have on boosting business productivity (and availability) for your applications?

The key to these and other related common questions is having insight and awareness into your current environment, via infrastructure performance analytics, for informed decision making.

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ADDRESSING DATA INFRASTRUCTURE CHALLENGES

To address data infrastructure challenges, you need to be able to obtain applicable metrics promptly. This means metrics that are relevant, real-time and do not require extensive manual effort to extract. There are many different tools and resources for obtaining metrics that matter. However tying those tools together, correlating, analyzing and visualizing can take time. In addition to gaining insight via metrics into how production application workloads are currently running and utilizing the infrastructure, another challenge is using those metrics for the simulation to help you predict the future.

Simulations can be used for assessing and validating new or planned technology as part of acquisition decision making. Other common uses of a simulation (aka workload modeling) are to understand how new or changing applications and workloads impact performance as well as availability. Another use for simulations is to troubleshoot, forecast and perform what-if analysis to prevent problems. Data infrastructure performance analytics solutions help you answer:

- What's your deployment plan and how will you execute it
- What insight, tools, metrics, techniques are needed?
- Are your tools low or no-cost yet labor intensive?
- Will you DiY as an integrator of tools, or use a solution?
- What can be automated vs. manual intensive processes?
- Which settings and parameters to use for simulations?

There are various tools that are part of your servers, storage, networks and hypervisors as well as cloud resources. You can get third-party and open source tools, glue them together to collect information and some of the metrics that matter. Likewise, there are freeware tools that can be configured to simulate workloads, but how accurate are these simulations?

Another consideration is whether the workload simulations (aka so called benchmarks) accurately represent your specific production environment, or are they relevant to somebody else? Part of developing and expanding your data infrastructure performance, availability, capacity planning, tuning, optimization and engineering tradecraft skillsets is gaining relevant knowledge to make informed decisions vs. guessing.

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HOW TO AVOID FLYING BLIND METRICS ENABLED MANAGEMENT

To avoid flying blind, being in control and making informed decisions requires timely and relevant insight into your data infrastructure, application workloads and resource usage. You can get metrics from various sources. However, how will you correlate, analyze and visualize those results in a timely manner? Likewise, how much of your time will be spent working to get the metrics instead of analyzing and acting upon them?

Performance metrics that matter include IOPs, transaction reads and writes, along with response time latency among others. Having metrics that matter and are applicable to the data infrastructure that supports your applications enable optimization of performance, resources, effective productivity, and availability. The metrics that matter are the ones relevant to your application workload.

In addition to being able to gain insight and awareness coupled with analytics is the ability to perform applicable simulations. Simulations enable you to gain insight into how different workloads will have an impact on, and utilize data infrastructure resources effectively.

Simulations enable you to practice, validate, learn, compare and refine how data infrastructure including storage can be optimized prior to deployment, avoiding future production problems.



Virtual Instruments Infrastructure Performance Analytics Enabling Data Infrastructure and Application Insight & Awareness

Virtual Instruments delivers analytics platforms for data infrastructure performance validation, optimization, insight and awareness. Solutions include VirtualWisdom® and WorkloadWisdom, enabling real-time visibility into infrastructure performance, health, and utilization. Virtual Instruments performance analytics solutions enable customers to optimize the performance and availability of their mission-critical applications across physical, software-defined virtual and cloud environments.

Features and benefits enabled by Virtual Instruments solutions include:

- Leverage the collective best practices and analysis of peers that are “baked” into the solution
- Analytics to enable data infrastructure and application workload optimization
- Automate, collect, assess, analysis, visualize, simulate, model, forecast and plan
- De-risk data infrastructure configuration and deployment decision-making
- Find and fix problems to prevent outages and slowdowns
- Maximize ROI of IT infrastructure investments and staff resources
- Establish baseline performance insight for troubleshooting and tuning
- Accurate, repeatable, relevant metrics that enable highly realistic simulations
- Remove complexity along with cost and associated overhead while improving service delivery

Insight, Analytics, Awareness

VirtualWisdom®



VirtualWisdom enables real-time insight into the performance of your data infrastructure application workloads. Having timely accurate insight facilitates troubleshooting, diagnostics, finding and fixing problems. In addition to performance optimization along with accelerated troubleshooting, having insight removes risk from production slowdowns and eliminates finger-pointing between IT silos.

Simulation, Insight, Analytics, Awareness

WorkloadWisdom



WorkloadWisdom, formerly known as Load DynamiX, enables workload acquisition, analysis, and simulation that is fully representative of your environment, enabling “at-scale” testing without complexity before production deployment. IT engineers using WorkloadWisdom can evaluate new products and technologies before making acquisition decisions and also enables testing of infrastructure changes before live deployments. In other words, WorkloadWisdom puts you in the driver’s seat for making informed data infrastructure resource decisions to avoid flying blind.

Consider and look for infrastructure performance analytics solutions that not only automate and take care of things for you in an auto-pilot mode but also provide insight and a learning experience. For example, with the continued growth, scale and interdependence, automation helps to manage those complexities. Does the tool or solution provide the ability to learn, enable analysis and gain insight into why things are behaving as they are? In other words, can the automated solution help you manage while expanding your tradecraft experience and skill sets, while also applying those to your data infrastructure optimization needs?

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VirtualWisdom® – Insight, Analysis and Awareness

Having timely relevant insight and awareness into your information factory and data infrastructure is extremely important. Application workload behavior is not the same across different environments, data centers (information factories) and data infrastructure components (hardware and software).

VirtualWisdom key features and benefits

- Transparent data collection with agentless probes and purpose-built monitoring hardware
- Intelligently collect, correlate and analyze deep breadth of data for insight
- Transforms data into useful data infrastructure insight information
- Performance and availability insight for physical, virtual and cloud environments
- Real-time analytics puts you in control of performance decision-making
- Removes complexity and costs while boosting productivity

WorkloadWisdom – Workload Analysis and Load Generation

Virtual Instruments WorkloadWisdom is a solution that enables data infrastructure insights by combining automated workload I/O profile acquisition and analysis, with advanced testing and load generation technology. It enables engineers, architects, performance and capacity planners to gain insight and awareness of various application behavior with their PACE needs. Virtual Instruments WorkloadWisdom enables you to validate how new server, network, and storage I/O technologies including flash, hybrid, converged, cloud, virtual and software-defined will perform with your applications workloads while removing complexities (and associated costs).

WorkloadWisdom key features and benefits

- Repeatable, accurate, applicable workloads and metrics
- Workload analysis, simulation, modeling and testing
- Insight into application performance and resource usage
- Introduce application changes without causing problem
- Enables you to find performance limits before deployment
- Puts you in control of vendor decision-making
- Finding and fixing problems before they become issues
- Removes complexity and costs while boosting productivity

WorkloadWisdom is similar to a Flight Simulator to learn and test new procedures, workload assignments, and other changes. The benefit is you can safely and cost effectively learn, gain insight, perform analytics, accurately as well as repeatedly assess changes and new technologies to support your applications without causing a crash or leaving you stuck on the ground trying to learn how to fly.



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SUMMARY AND WRAP UP

What this all means is that the key to making smart, informed decisions involving data infrastructure, servers, storage, I/O across different applications is having insight and awareness. See for yourself how you can gain insight into your existing information factory environment performing analysis, as well as comparing and simulating your application workloads for informed decision making.

Infrastructure performance analytics solutions like those from Virtual Instruments enable you to maximize your return on investment by allowing you to spend more time on analysis and planning vs. troubleshooting and developing and maintaining custom tools to assure the performance of your infrastructure. Avoid flying blind, make sure your data infrastructure is properly instrumented and monitored to tell you where you have been, where you are now and where you are going as well as provide actionable resource utilization and performance data.

Visit www.virtualinstrument.com to learn more, as well as to try it yourself to see how you can ensure performance and increase your return on investment. Additionally, you can drive return on innovation using the Virtual Instruments enabling technologies to avoid flying blind with your data center and your data infrastructure decisions. Also, visit www.workloadcentral.com for free workload I/O profiling and to join the community to learn and share insights around workload simulation and modeling.

ABOUT THE AUTHOR

Greg Schulz is Founder and Sr. Consulting Analyst of independent IT advisory consultancy firm Server StorageIO and UnlimitedIO LLC (e.g. StorageIO®). He has worked in IT for an electrical utility, financial services, and transportation firms in roles ranging from business applications development to systems management, architecture, strategy, performance, and capacity planning. Mr. Schulz is the author of the Intel Recommended Reading List books “Cloud and Virtual Data Storage Networking” and “The Green and Virtual Data Center” via CRC Press and “Resilient Storage Networks” (Elsevier). Greg is a Microsoft MVP and VMware vSAN vExpert. Learn more at www.storageio.com and www.storageioblog.com. Follow on Twitter @StorageIO.

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