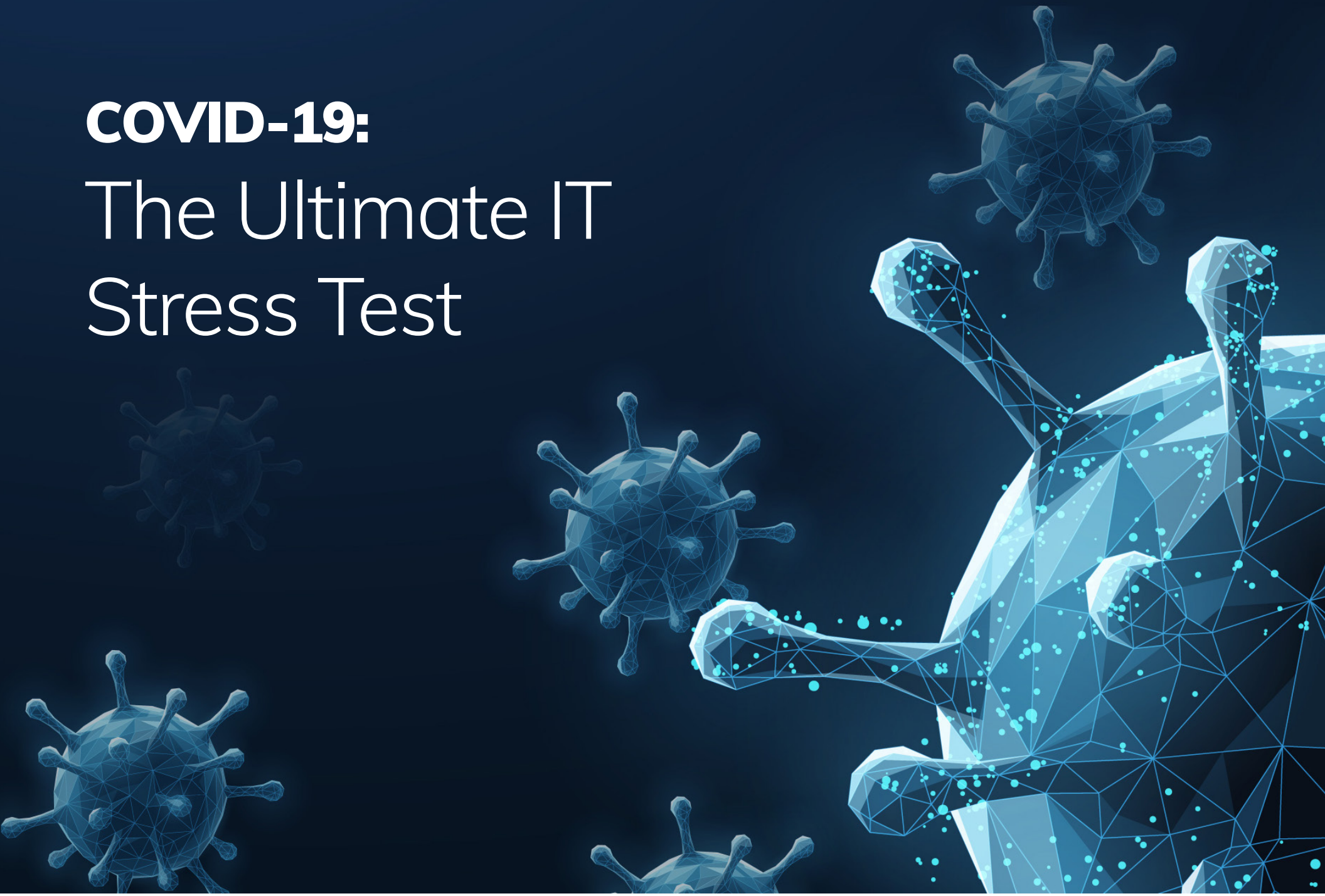


COVID-19: The Ultimate IT Stress Test



The coronavirus (COVID-19) pandemic has impacted every aspect of life, uniting governments, the scientific community, and healthcare workers across the world in the struggle to bring it under control.

Global supply chains, resources, and entire healthcare systems have been strained to their breaking points with shortages of many basic supplies needed by front line workers. Not too surprisingly, supporting IT systems are also being pushed to their limits.

Our need to understand the virus to develop a vaccine has fostered unprecedented levels of global cooperation. Scientists and healthcare workers have captured vast amounts of data now being stored in shared data banks. Unfortunately, most of the data may never be analyzed due to practical processing limitations. The pandemic has proven to be the ultimate IT resource stress test. Undoubtedly, few organizations factored a global pandemic into their business continuance (BC) plans.

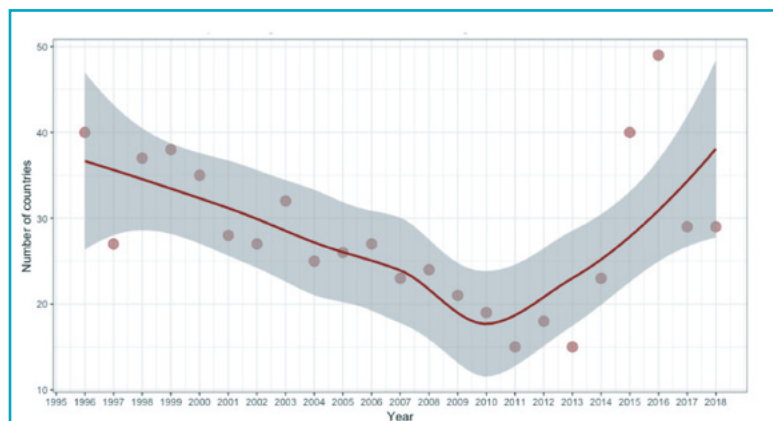


FIGURE 1

Source: Harvard Global Health Institute/World Economic Forum analysis of data from WHO Disease Outbreak News

<http://www.who.int/csr/don/en/>

Recent researchⁱ indicates that the COVID-19 virus (SARS-CoV-2) spreads so quickly because it is a new virus, so humans have no natural defenses to fend it off. The alarming part is that according to a joint report by Harvard Global Health Institute and The World Economic Forum,ⁱⁱ epidemics are occurring with increasing frequency (Fig. 1).

An epidemic is simply a localized version of a pandemic. It follows that pandemics, too, will increase as international travel aids the spread of infectious diseases. In fact, a disease in a remote village can reach a major city on the other side of the globe in as little as 36 hours.ⁱⁱⁱ

In this document, we'll look at trends and challenges in healthcare, the impact of COVID-19 as a catalyst for change, and the importance of infrastructure health and performance optimization to serve the needs of life science research, drug discovery, and hospital care. COVID-19 has been the single largest shock to the global healthcare system, serving as a wake-up call and causing IT organizations to rethink and revise their BC plans. When the next shock comes, will you be ready?



“The pandemic has proven to be the ultimate IT resource stress test.”



KEY TRENDS & CHALLENGES

Many of the trends and challenges in research and healthcare IT (HIT) are not new; however, others such as the slowing of IT investment are a direct result of the uncertainty brought on by the coronavirus pandemic.

Operational costs, budget constraints, and profitability expectations:

The impact of the pandemic has led businesses to make drastic changes in response to the rapidly shifting economic climate. Almost all have delayed investments until they have a better idea of how long the crisis will last. According to analyst firm IDC's latest projections, overall IT spending is expected to decline by 5.1 percent. That's in contrast to last year's spending growth of 5 percent. This means that CIOs must optimize the resources they already have.

Healthcare consumerism:

Payers (insurers) and providers (point of care professionals) have long encouraged patients to take a more active role in their own care. Patients are responding by demanding more care options and increased control over their patient data. They want anywhere, anytime access via mobile platforms. With the shift to value-based medicine, expect this trend to continue as payers and patients alike post reviews and ratings for the care that they receive.

Advances in technology:

New scientific methods and connected medical devices are streaming large amounts of data that needs to be analyzed. In response, organizations are augmenting their infrastructure with cloud-based resources that scale on demand and support emerging tools such as artificial intelligence (AI). The resulting hybrid architecture presents a host of

new challenges, including data locality and sharing, system compatibility and security, and application performance optimization across multiple platforms.

AI promises to help both the scientist and clinician to glean new insights from these disparate data stores. However, issues such as data access, ownership, and compatibility often result in data silos that actually slow the pace of discovery and impede patient care.

Increasing cybersecurity risks:

Telemedicine and remote patient care also pose new challenges for IT organizations. Providing secure three-way access to exchange data between patients, payers, and providers requires changes to the infrastructure in lock-step with government regulations. It also requires the creation of new patient-friendly applications and portals.

Evolving government and compliance requirements:

The regulatory landscape continues to change rapidly, driving care providers and payers to quickly adapt their IT systems to comply with the new regulations whether on-premises, in the cloud, or hybrid to ensure continuity and compliance.

As organizations look for ways to optimize their IT investment, it is important to consider the impact these trends will have on their infrastructure, service level agreements (SLAs), and the user experience.



IT PERSPECTIVES: Coping with COVID-19

What is it really like in IT during the global pandemic? A common question with a common answer, "Do more with less and fewer." We asked Virtana customers to share their experience as a basis for comparison to what you may be experiencing.

TEXAS UNIVERSITY HOSPITAL



IT administration for a leading Texas university hospital is a challenging task because it involves researchers, clinicians, and students, all with different needs. An IT leader described the current pandemic related environment this way:

- Income-generating patient services have been eliminated
- Spending on COVID-19 research has increased significantly
- IT headcount has been cut 14%, and the remaining staff is on reduced work hours
- Current projects requiring IT support include a multi-petabyte storage migration, Office365 implementation, and transitions to a new EHR system and to ServiceNow. No adjustments to project priorities or timelines have been made

"The Virtana platform helped us architect a very efficient and highly optimized environment, so we've been able to manage the unexpected increase in workload without outages or impact to our users. We're also able to better manage the resources that we have in spite of the budget and staffing changes, allowing us to concentrate on the critical projects already in flight."

THE NEW NORMAL IN HEALTHCARE

The coronavirus pandemic exposed significant gaps in Business Continuity (BC) planning and resource allocation. Even the most detailed plans failed to capture supply chain vulnerability to system-wide disruptions.

The new normal will be that such plans encompass everything from personal protective equipment (PPE), to staffing, to essential resources and services. Other changes likely to affect HIT organizations include:

- Connecting EHR systems into the supply chain for automated ordering, and the development of supply “exchanges” for alternate sourcing
- Expanded use of telemedicine to support remote workers and team collaboration
- Streaming video tied to diagnostic equipment to continuously and safely track self-isolated patient progress, reducing risk to front-line workers and lowering consumption of PPE
- Support for rapid deployment of remote facilities (tents, shelters, and non-traditional structures) for triage and overflow capacity
- Informing and guiding the public for self-isolation through the use of AI driven chat bots
- Increased emphasis on data sharing and collaboration amongst Payer/Provider/Patient through information exchanges to help spot fraud and entitlements and to accelerate authorization and reimbursement
- Increased reliance on AI/predictive analytics

The most impactful of these changes is expected to be the expanded use of AI and predictive analytics, which hold great promise for researchers, pharmaceutical companies, and clinicians to accelerate discovery, identify new drug compounds and interactions, and narrow treatment options. AI is the only practical way to analyze the mountains of data that are being captured. However, AI is still not ready for prime time for many clinical use cases, especially where end-to-end clarity and reproducibility in decision making are key requirements. The FDA is tasked with approving AI algorithms prior to clinical use. To its credit, the FDA has been moving quickly to evaluate new algorithms according to research by Ernst and Young (Fig. 2).

For IT organizations, AI presents several technical challenges, chief among them are more diverse workloads and infrastructure performance requirements that more closely resemble high performance computing (HPC) systems than the enterprise systems that administrators are used to. Many forms of AI benefit greatly from the use of graphics processing units (GPUs) that process data in parallel. This requires developers to understand efficient parallel programming methodologies. The AI application stack is also highly sensitive to performance changes and requires specialized tools to monitor, optimize, and support such workloads.

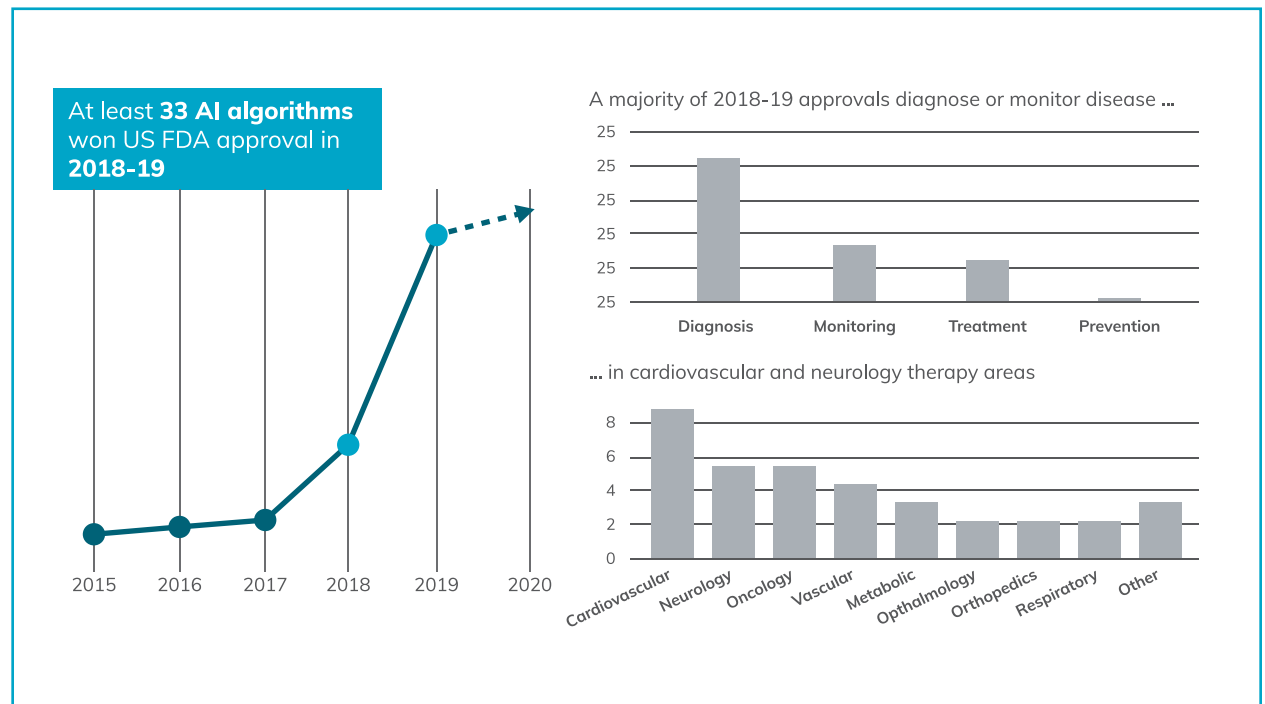


FIGURE 2

Source: EY, US Food & Drug Administration. Number of approvals may exceed 33 because some approvals may be mapped to multiple use cases or therapy areas.

CHANGING WORKLOADS

As the use of AI grows, IT organizations have begun to see changes in the number, type, and diversity of applications and the corresponding workloads.

In coronavirus research, for example, the three primary workloads are:

1. **Basic biology and molecular dynamics:** Much of the drug screening work focuses on chemical compounds, molecular dynamics, and simulations to understand how and where the virus attacks a host cell. Such workloads are the most computationally intensive.
2. **Genomics:** To better understand the evolution of the virus, researchers look at the host genome that's being infected to understand what factors in the genome have changed that will affect the outcomes and infection rates. Genomics produces large volumes of data that is often stored temporarily for later downstream processing, so it is compute, storage, and network intensive.
3. **Epidemiology:** Much of what is known about how the coronavirus spreads comes from identifying patterns in how people interact, their travel patterns and frequency of travel, and the effect social distancing has on mitigating the spread. Epidemiology is also used to forecast hospitalization and death rates. This is the least computationally intensive workload.

Hospital IT environments, by contrast, support a common yet very broad set of commercial applications, and the underlying infrastructure is based on standard hardware with defined performance characteristics. In aggregate, the processing patterns more closely resemble a traditional enterprise than a research

environment. However in healthcare, data traffic and processing patterns are typically much more dynamic, and sensitivity to system outages is far greater. System management under such conditions is extremely difficult.

BRIDGING THE GAP BETWEEN INFRASTRUCTURE AND APPLICATION MANAGEMENT

Post-COVID, HIT organizations will need greater agility to support the changes required by the “new normal”.

Deeper insights into the interdependencies of infrastructure and applications are crucial to maintaining SLAs and optimizing system performance under increasingly constrained budgets. Hybrid cloud environments impact IT agility because administrators must use one set of tools to manage and monitor cloud resources and another for on-premises resources. Administrators are then forced to stitch together a disjointed set of partial views from individual tools to get an approximation of their overall environment's performance.

Virtualized resources, common in hospital settings, add another level of complexity by obscuring true system performance and resource utilization. This makes it difficult to predict and prevent such issues as poor virtual machine performance or application disruptions when migrating them to the cloud. Bridging these gaps calls for real-time visibility into system and application performance using tools that support the complexities of the post-COVID era.



IT PERSPECTIVES: Coping with COVID-19

LARGE MIDWEST HOSPITAL NETWORK



As hospital networks seek to add new services, post-acquisition systems integration causes some very difficult challenges – redundant applications, incompatible EHR systems, and incompatible database structures. A large hospital network described their new normal:

- A significant reduction in elective services, resulting in a quarterly loss of nearly \$400M
- Mandatory worker time off, furloughs, and an increase in employee turnover

The network of care facilities consists of twelve hospitals and over 175 clinics, 50,000 users, 1800 applications, and 3PBs of storage, which is growing rapidly. We replicate operations between two data centers, and a recent hospital acquisition added another two data centers. Plans call for the consolidation of applications and data centers, merging of two EHR systems, and moving workloads to the cloud.

“The Virtana platform is the only suite of tools we’ve found that helps with problem determination and profiling application demands on the underlying infrastructure. This helps us size our new environment, identify misbehaving applications, and project cloud costs and performance before spending any money to move our applications. That takes a lot of the stress and risk out of implementing our hybrid IT strategy.”

VIRTANA: MITIGATING SHOCKS TO THE SYSTEM

To be prepared for future shockwaves, HIT organizations must rethink their BC strategy, taking into account the trends and challenges that have contributed to the new normal.

Survival means taking control of mission critical public, private, and on-premises (hybrid) infrastructure; gaining clarity to fully understand the infrastructure, application priorities, and the interdependencies between each; and most importantly, investing in tools capable of managing hybrid infrastructure as it expands and changes over time.

Virtana offers a unified approach to managing IT operations across hybrid environments. Their VirtualWisdom, WorkloadWisdom, and CloudWisdom platforms and Cloud Migration Readiness (CMR) service are seamlessly integrated to form the foundation of next generation hybrid infrastructure management. An agent-less architecture saves time, simplifies management, and eliminates the risk of disruptive upgrades. Administrators can proactively manage, monitor, and model both application and infrastructure performance through a single-pane-of-glass, even across multiple environments.

The Virtana Platform:

VirtualWisdom

VirtualWisdom optimizes the performance, availability, and cost of mission-critical application infrastructure across private cloud compute, network, and storage as well as hybrid cloud infrastructure. Compute, network, storage, and operating system resource relationships are directly discovered and correlated via API with leading application performance management (APM) solutions and configuration management databases (CMDBs). VirtualWisdom then applies AI technology to provide deep insights into app-centric traffic with fine-grained,

real-time reporting of performance, consumption, and service levels across the entire application infrastructure stack.

VirtualWisdom's analytics apply AI, ML, and heuristics across full application infrastructure sets, identifying problems before they cause downtime, determining root cause, eliminating shared infrastructure conflicts, right-sizing infrastructure sets to task, automatically discovering application topologies, automatically apply best-practice monitoring, eliminating alarm storms, and more.

WorkloadWisdom

A key challenge facing healthcare and research organizations is understanding the effects of the new normal on existing or proposed system changes. Imagine being able to accurately simulate changes to storage scale and performance using data derived from your applications in your environment. WorkloadWisdom uses an AI-driven analytics engine to provide deep insights into storage operation, capacity, and performance. Highly realistic workload models created using an API and

hardware level wire-data allows for automated scalability planning, performance simulation, and problem resolution that reduces risk while optimizing both performance and cost.

With WorkloadWisdom, administrators can record, playback, and scale existing workloads on existing or new hardware configurations to model variations in workload performance under load. The result is intelligent, vendor-independent decisions about storage purchases, configuration changes, and new deployments.

CloudWisdom

According to a joint study by HIMSS Media, Red Hat, and Perficient, public cloud adoption is accelerating, and most healthcare organizations draw on the experience of peers for cloud provider recommendations (Fig. 3).

Aside from security, major concerns with using the public cloud are the expense and open-endedness of cloud costs. This is especially problematic for grant funded research where data sharing is mandated for a period of time that often exceeds the term of the grant.

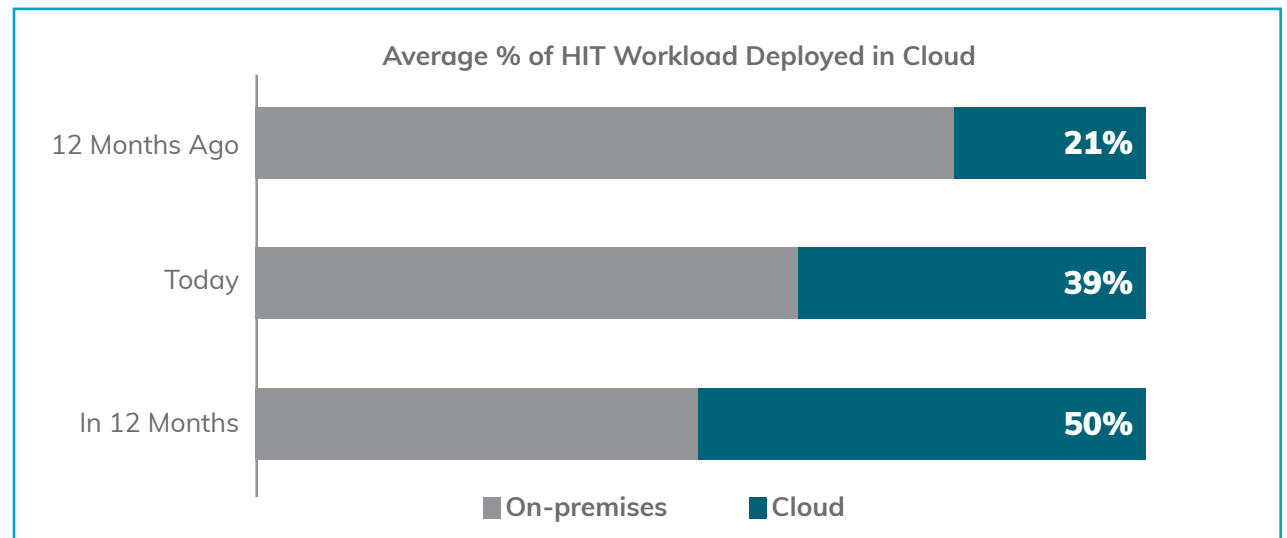


FIGURE 3

Study: HIMSS, Red Hat, Perficient

CloudWisdom reduces open-ended risk by delivering multi-cloud cost optimization and instance right-sizing, enabling organizations operating in public cloud environments to balance performance, capacity, and cost. The solution monitors usage to prevent end-of-the-month billing surprises, and discovers unused resources that can be eliminated. It also provides right-sizing recommendations that balance cost versus performance and includes detailed purchase planning to strike a balance between deep savings and infrastructure agility.

With CloudWisdom, growing cloud costs are kept in check with multi-dimensional bill analytics. For example, capacity planning is simplified with automated sizing recommendations based on historical usage data, and SLAs are met on a budget with proactive recommendations for reservations and purchase planning.

Cloud Migration Readiness (CMR)

With the increasing migration of research and healthcare applications to the cloud and the adoption of modern workloads such as AI, image analysis, and natural language processing, IT organizations are faced with very difficult questions, “Which workloads to migrate and which to retain?” and “How do I choose the best cloud provider for my applications?” Application migration is fraught with risk, especially when the applications are live. Achieving seamless cloud migration for essential services and applications is now a mission-critical task. Not every IT organization has the in-house expertise to plan and orchestrate such complex transitions.

Virtana CMR is a service delivered by seasoned experts that remove the risk from cloud migration by validating the suitability of targeted applications based on their on-premises performance SLAs, dependencies, the preservation of performance in the cloud, and estimated costs – all before the migration ever takes place (Fig. 4). Migration experts partner with the customer’s technical team to provide the answers to these critical questions before the first data bit gets migrated.

BENEFITS TO RESEARCH AND HEALTHCARE IT

Science and research environments and applications differ greatly from those found in hospitals and clinics.

Yet, all of these environments and workloads are impacted by a common set of trends, trends affected increasingly by the coronavirus pandemic. In responding to such a global crisis, IT organizations face increasing adoption of cloud technology, remote workers and telemedicine, changing workloads, and shrinking budgets. The sheer complexity of IT operations has gotten to the point that existing tools and techniques are no longer adequate.

The Virtana platforms accelerate scientific research and discovery and patient care in the following ways:

- Accelerating problem resolution for less downtime so more time is spent conducting research or on patient care
- Providing efficient management of capacity and cost for reduced operational costs and a greater return on the IT investment
- Simulating and automating workload migration and placement for reduced migration risk and more informed purchase decisions
- Optimizing both system and application performance for reduced time to discovery or faster diagnosis and patient treatment

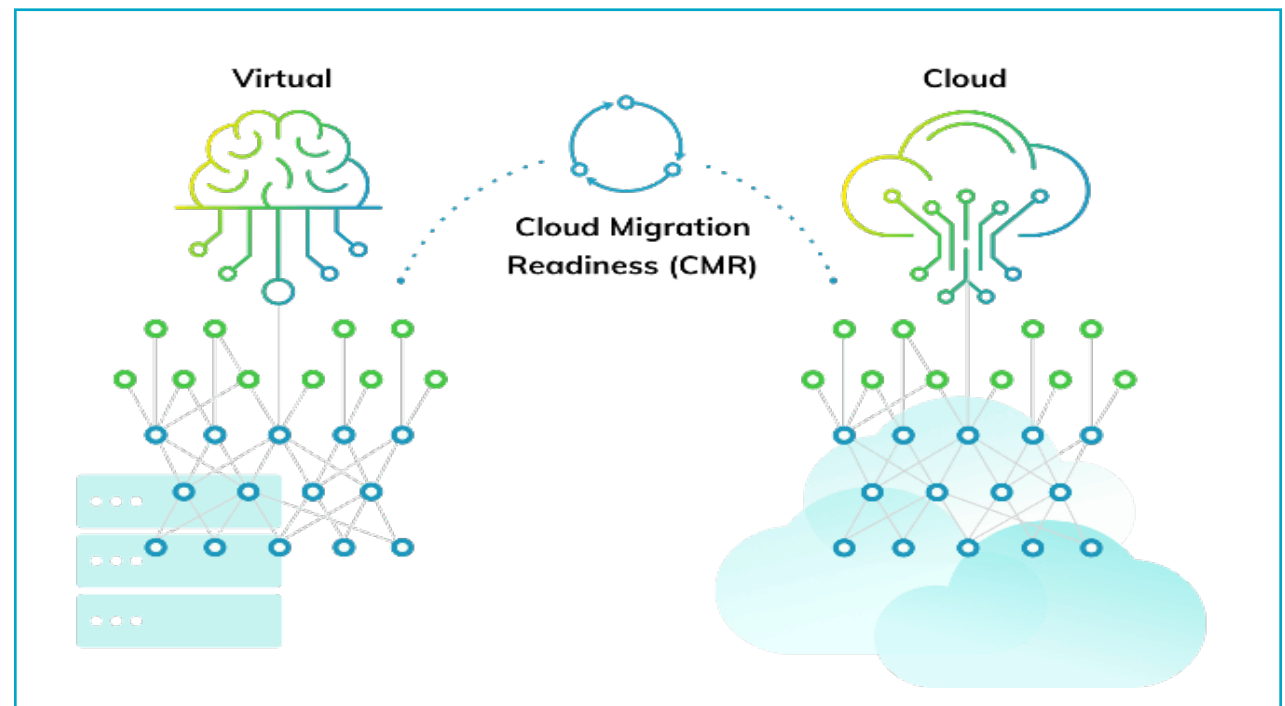


FIGURE 4

ARE YOU READY?

COVID-19 coupled with the quickening pace of viral outbreaks is fair warning that IT organizations must revisit and adapt their priorities, practices, and BC strategies to be more agile.

Even as scientists and front-line workers struggle with the current pandemic, the next one is brewing, and there will be even less time to prepare and respond. The Virtana platforms help you today and prepare you for tomorrow through AI-driven intelligent automated discovery, monitoring, modeling, optimization of hybrid infrastructure.

When the next shockwave comes, be ready.



[Learn](#) more about
VirtualWisdom



[Contact](#) a
Virtana Expert



[View](#) more
Resources

Virtana
2363 Bering Drive
San Jose, CA 95131
Phone: +1.408.579.4000

- i <https://science.sciencemag.org/content/369/6501/315>
- ii http://www3.weforum.org/docs/WEF%20HGHI_Outbreak_Readiness_Business_Impact.pdf
- iii <https://www.weforum.org/agenda/2020/03/coronavirus-global-epidemics-health-pandemic-covid-19/>
- iv <https://www.idc.com/getdoc.jsp?containerId=prUS46268520>
- v <https://www.forbes.com/sites/brucejapsen/2020/06/17/big-blue-cross-plan-in-deal-with-epic-to-improve-doctor-insurer-information-exchange/#34398d40688d>
- vi <https://michealthcare.com/2020-will-be-a-defining-year-for-hospitals-and-healthcare-technology/>
- vii <https://pages.healthcareitnews.com/rs/922-ZLW-292/images/HIMSS%20Cloud%20Outlook%20Technology%20Research%20Report%202019%20web.pdf>