Proactive Incident and Problem Management

Intelligent analytics and automated control reduce downtime, increase responsiveness, and drive increased investment in innovation

VMWARE WHITE PAPER

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Preface

Today's IT organizations are under increasing pressure to deploy private or hybrid clouds and become a service provider to their business users. In many cases, this change is motivated by the increasing prevalence of business users going outside of corporate IT to procure IT services direct from external cloud vendors. In other cases, IT organizations view cloud as the answer for enabling greater innovation in the business. Whatever the catalyst, those organizations that have started making the move to cloud have already realized real gains in efficiency, agility, and reliability.

Based on its extensive experience working with customers on their implementations, VMware has identified five capabilities that are essential to unlocking the efficiency, agility, and reliability benefits of cloud:

- **On-demand services:** Service catalog with standardized offerings and tiered SLAs, actively managed and governed throughout its lifecycle, and with end-user access via a self-service portal
- **Automated provisioning and deployment:** Automated provisioning, release and deployment of infrastructure, platform and end-user compute services
- **Proactive incident and problem management:** Monitoring and filtering of events, automatic incident resolution, and problem diagnosis
- **Cloud security, compliance, and risk management:** Security, compliance, and risk management policies embedded into standard configurations enabling policy-aware applications and automation of security, audit, and risk management processes
- **IT financial management for cloud:** IT cost transparency and service-level usage-based showbacks or chargebacks using automated metering and billing tools

This white paper introduces proactive incident and problem management and discusses its business impact and implementation.

Executive Summary

As the IT infrastructure has grown, the approach to managing incidents and problems has evolved, from help desk to tiered support to integrated management. However, these approaches have all been reactive, essentially devising better and faster ways to fix broken components. The cloud makes a reactive approach untenable for several reasons:

1. The typical enterprise data center has far too many objects to manage with spreadsheets and configuration management databases (CMDBs).
2. Virtualization—a key enabling technology for the cloud—abstracts the physical infrastructure, making it difficult to identify the physical component responsible for a service outage or performance problem.
3. Public cloud services, an essential element of a hybrid cloud strategy, hide the details of the physical implementation from customers.

A proactive approach to incident and problem management is an essential capability that allows organizations to realize the full range of benefits—efficiency, agility, and reliability—from cloud computing. Proactive management relies on intelligent analytics to automate control of the cloud infrastructure. Correlating metrics from a number of tools, analytics can identify trends that help to pinpoint potential problems early and allow corrective action before problems occur. Intelligent analytics assure the quality of business services, improve the user experience, and increase utilization of platform resources. Unlike the reactive system, IT can now handle exceptions and potential problems through regular maintenance cycles in an orderly and predictable way.

Migrating to a proactive system requires a carefully orchestrated plan that includes a pilot program and phased cutover. There are organizational considerations involved in proactivity, including the establishment of a Cloud Infrastructure Operations Center of Excellence and changes to individual job functions. These changes must be carefully planned and effectively communicated across the organization to ensure a successful transition to a proactive system.

Context

Realizing the full potential of the cloud requires an incident and problem management system that is as agile and dynamic as the cloud itself. IT needs better data analysis tools and a policy-based automated system that can manage entire services as opposed to individual components.

Evolution of Incident and Problem Management

As background information, it is helpful to trace the evolution of IT's approach to incident and problem management.

Generation 1: The Help Desk

Users called the help desk, which opened tickets and routed them to IT technicians. Some organizations had deployed monitoring tools for limited parts of the infrastructure, but they usually had hard thresholds and generated a large number of false positives. Automation was virtually nonexistent. Most incidents were handled manually by support teams of system administrators, which constituted a substantial fraction of the total IT headcount.

Generation 2: Tiered support

IT groups developed management frameworks—ITIL is one example—that could be implemented in higher-level tools. Manager of managers (MoM) tools provided an integrated view of incidents and problems—often called a "single pane of glass." Wider deployments of monitoring tools generated an avalanche of incident data, but still far too many false positives to be completely trusted. While the level of automation increased, most incident-handling processes were still manual.

Generation 3: Integrated management

The latest generation features a configuration management database (CMDB) intended to make clear the relationships among the tens or hundreds of thousands of components that make up today's IT infrastructures. Management tools incorporate dynamic thresholds and other ways to minimize false positives and improve reliability. However, the complexity of today's IT infrastructures can still overwhelm the tools. For example, consider a multitiered Web application that is driving a high volume of traffic. A single problem in the network can trigger hundreds of incidents as each tier generates an alarm for every failed transaction. For the most part, the analysis of incident and problem information still relies on human intervention.

What is Proactive Incident and Problem Management?

The days of waiting for the phone to ring to find out about incidents and problems are in the past. In a proactive approach, the cloud anticipates performance and capacity issues and deals with them as part of the organization's maintenance function—before users are even impacted. The cloud can move workloads to mitigate hardware failures and avoid downtime, allowing IT technicians to repair faulty components offline as part of maintenance workflows. Proactive management represents a fundamental shift in the operating model, one that puts IT back in charge of the organization's vital infrastructure.

The Cloud Capability Model

In working with global enterprises and service providers, VMware has found distinct patterns of IT organizations and their capabilities as they move to embrace cloud computing. VMware has used this insight to establish a Cloud Capability Model, helping IT identify opportunities for growth and evolution of technologies and architectures, organizational models, operational processes, and financial measures. This Cloud Capability Model provides a path for IT to take greater advantage of existing systems, teams, and resources, embrace third party cloud assets and providers, and extend IT standards for security, governance and performance into this new model for IT. Across the Cloud Capability Model, customers are able to break free from a situation where resources are exhausted by simply maintaining existing systems to an environment where IT is a clear strategic business partner, delivering new services and capabilities aligned to and in support of business goals.

Proactive incident and problem management should be understood in the context of the Cloud Capability Model, which provides a roadmap to help organizations assess their current state in regard to people, processes, technology, and business management, and plan cloud initiatives (Figure 1).

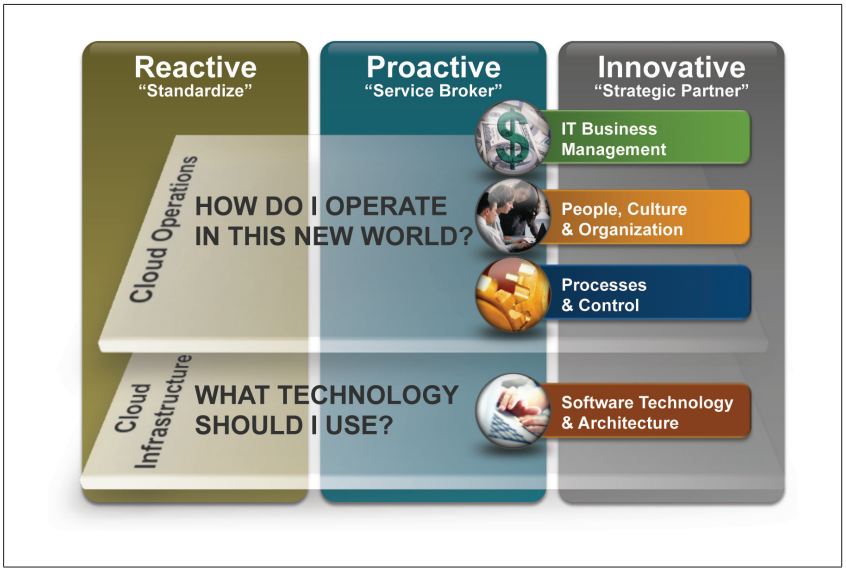

Figure 1. Cloud Capability Model

Reactive: With IT exhausting resources maintaining existing systems, the organization is challenged to make the desired contribution to future business results. A common response is to standardize the infrastructure, which reduces complexity and reclaims some IT resources for strategic work. The need for rapid innovation has driven business stakeholders outside of traditional IT channels, creating a tension between IT and business stakeholders. As a result, cloud has entered the business opportunistically, threatening to create silos of activities that cannot satisfy the mandates for reliability and IT efficiency.

Proactive: IT has moved to embrace cloud as a model for achieving the innovation requirements of the business through increased efficiency, agility, and reliability. Shifts in processes and organizational responsibilities attempt to bring structure to cloud decisions and directions. More importantly, IT has embraced a new role, that of a service broker. IT is now able to leverage external providers to deliver rapid innovation within the governance structure of IT, balancing costs, quality of service, and risks. This shifts cloud from being an opportunistic technology purchase to a strategic environment with broader business impact.

Innovative: IT has fully implemented cloud computing as their model for producing and consuming computing, shifting legacy systems to a more flexible infrastructure, investing in automation and policy-based management for greater efficiency and reliability and enabling a broad range of stakeholders to consume IT services via self-service. Detailed measurement capabilities enable IT to quantify the financial impact of sourcing decisions, redirecting saved resources to drive new services and capabilities that advance business goals. IT continues to successfully manage multiple resources from internal and external pools of infrastructure, balancing cost, quality of service, and risk metrics across heterogeneous environments.

Business Impact

Proactive incident and problem management offers a range of benefits that meets corporate mandates to improve efficiency, agility and efficiency.

Efficiency

IT time shifted from break-fix to innovation

Proactive incident and problem management reduces the time that IT staff spends fixing problems—a major resource drain in every IT shop. Most enterprises report that a cloud environment is much easier to manage day to day, another time-saver. Automating labor-intensive processes such as provisioning frees additional resources. The net effect is that scarce IT resources can be redeployed from problem-solving and routine tasks to high-value initiatives such as long-range planning, new service rollouts, and process improvement.

Reduced operating expenses (OpEx)

While every deployment is unique, experience shows that the OpEx savings generated by a proactive system can be substantial. Savings are generated by reducing:

- Per-incident costs
- Number of incidents related to changes in the infrastructure
- Number of erroneous tickets
- Problem closure time

Agility

Improved responsiveness to business users

Proactive incident and problem management improves the responsiveness of the IT staff because they have more time to interact with business users. Problems are resolved faster, which builds trust with users and fosters a cooperative working relationship. As a result, the business becomes more agile: IT staff has resources to respond to new requirements and can work closely with business units to take advantage of opportunities as they arise in the marketplace. The timeline for deploying new services is more compact, which translates into first-mover advantage and competitive differentiation.

Reliability

Reduced downtime and better SLA compliance

With a proactive system, IT managers can predict most problems before they cause slowdowns and outages, eliminating much of the downtime associated with a reactive approach. When outages do occur, the mean time to repair is shorter because of targeted troubleshooting—problems are resolved faster, with less impact on both users and IT staff. Fewer IT resources are diverted from strategic projects to break-fix activity, and users can be more productive—and more satisfied with the quality of business-critical services. Overall, IT is in a much better position to deliver on its SLAs while still driving innovation.

Planned incident resolution

Proactive management reduces the number of incidents in a cloud environment through the use of intelligent analytics and forecasting. Instead of responding to a problem report, the proactive approach anticipates problems before they occur and allows IT managers to schedule the response as a maintenance activity. Furthermore, for infrastructure issues, workloads can be proactively moved to avoid impacting the workload. Proactive incident and problem management gives IT the agility to perform these functions without end user impact. It avoids unnecessary overtime and allows resources to be redeployed to higher-value activities that improve business agility.

Process Design and Implementation

The components of a proactive incident and problem management system include:

- Fully automated workflows for remediating incidents for which no human input is required
- Highly automated interactive workflows for incidents where some operator input is required as part of decision support
- Operator-initiated automated workflows with runbook instructions for incident and problem handling
- Automated interactions between the incident and problem management process and other required processes and associated systems
- Key Performance Indicators (KPIs) that can be used to develop workflows and automations

To understand how proactive incident and problem management works, let's briefly examine the reactive approach in a cloud environment and then contrast it with the proactive approach (Figure 2).

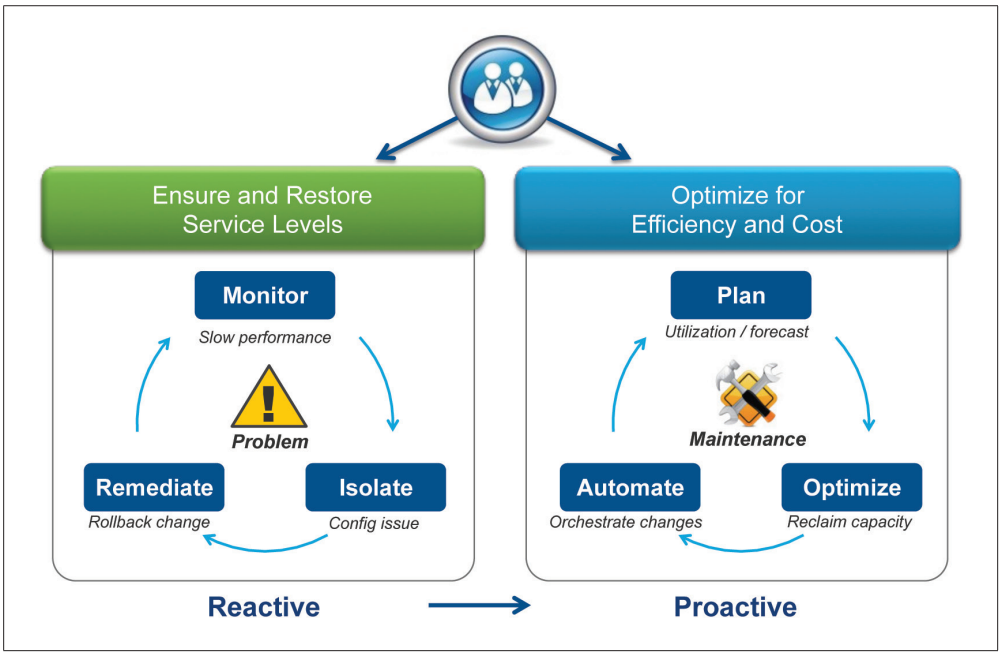

Figure 2. Reactive versus proactive incident and problem management

Reactive Management Fixes Problems

The focus of reactive management is on the problem; the goal is to ensure service levels by fixing problems as fast as possible. Problem-solving generally starts with an alert from a monitoring tool or a call from a user or developer. Taking the case of a cloud infrastructure, the approach is:

- Detect the problem (for example, slow performance in VM)
- Isolate the issue (identify a configuration problem with an operating system patch)
- Remediate the issue (roll back the patch or install the correct patch)

Proactive Management Plans Maintenance

Proactive management represents a fundamentally different paradigm. The main goal of proactive management is to prevent problems from occurring in the first place. While monitoring continues to play an important role, the primary activity is now planning. Instead of waiting for the inevitable problems, IT staff can forecast service-oriented parameters such as application performance and capacity requirements, optimize IT processes related to these parameters, and automate the optimized processes.

The proactive approach allows the cloud infrastructure to be managed as a maintenance function, predictably and systematically. Proactive management maximizes efficiency and reliability, and offers a more agile method for maintaining the cloud infrastructure at peak levels of performance. The system dynamically orchestrates a full range of corrective activities such as:

- Automatic configuration correction
- Resource tuning
- Capacity adjustments and provisioning
- Scheduled maintenance
- Service calls

Organizational Considerations

Cloud initiatives require not only the right technology but also organizational changes to people and processes. The most significant changes are to establish two new cross-functional departments, the Cloud Infrastructure Operations Center of Excellence (CoE) and Cloud Tenant Operations.

Cloud Center of Excellence

The Cloud Infrastructure Operations CoE coordinates the activities of all the organizational resources that are required to drive a successful cloud initiative. It brings together business analysts and technical experts under a single umbrella to consistently measure, account for, and improve the effectiveness of cloud infrastructure operations management (Figure 3).

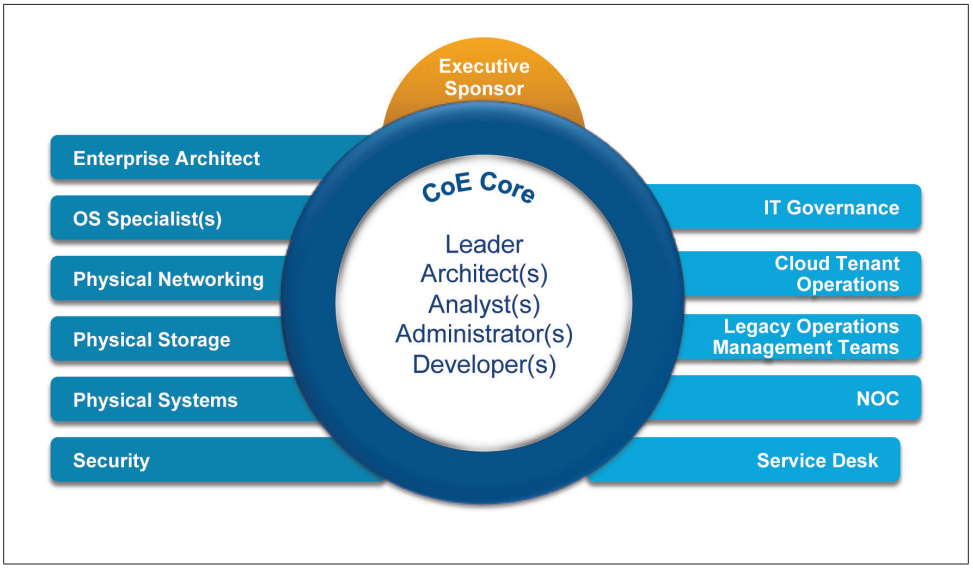

Figure 3. Cloud Infrastructure Operations Center of Excellence

These functional specialties within the Cloud Infrastructure Operations CoE have particular responsibilities for proactive incident and problem management:

Analyst

- Actively evaluates events, incidents, and problems looking for opportunities to promote to operators, as well as, automated or interactive workflows to offload from Cloud Infrastructure Operations COE
- Works with Service Desk or NOC to develop Run Book entries to handle events, tickets, or incidents
- Works with developers and administrators to implement the cloud infrastructure-impacting workflows to handle events, tickets, and incidents

Administrator

- Confirms that the cloud infrastructure is correctly instrumented for monitoring and logging purposes
- Works with developers to implement the cloud infrastructure-impacting workflows
- Works with the NOC to develop cloud-specific remediation activities

Developers

- Works with Cloud Infrastructure Operations COE members and ecosystem team to establish automated event or incident remediation wherever possible and appropriate

Cloud Tenant Operations

Cloud Tenant Operations manages service governance, service design and development, service operations, and provisioning (Figure 4).

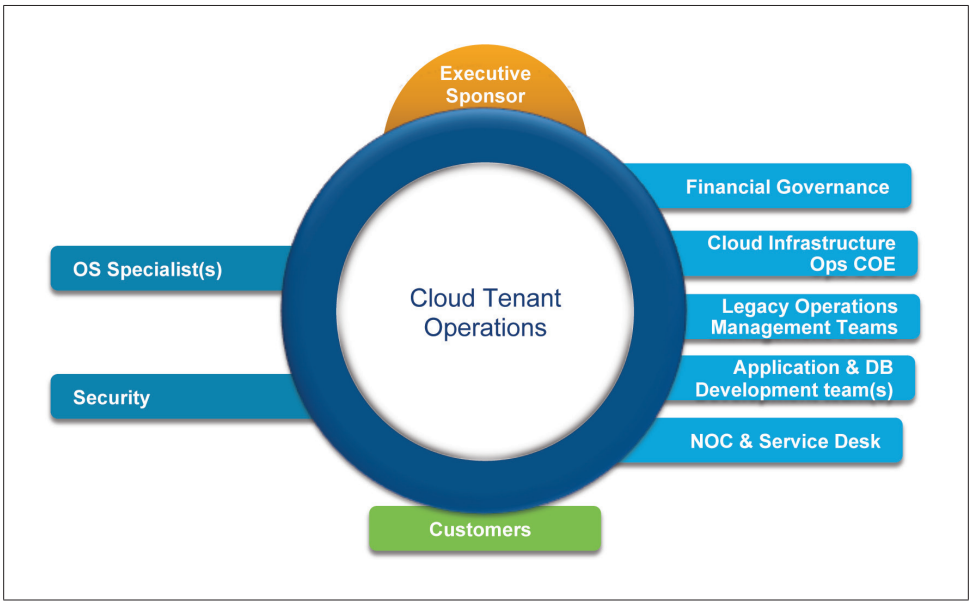

Figure 4. Cloud Tenant Operations

These functional specialties within Cloud Tenant Operations have particular responsibilities for proactive incident and problem management:

Service Owner

- Keeps actively informed about tier 3 support and escalations for the cloud service offering(s) for which they are responsible

Service Architect

- Provides tier 3 cloud service offering support as needed

Service Developer

- Works with Cloud Service Analyst and Application Development to establish automated event remediation wherever possible and appropriate

Service QA

- Trains service desk staff to support production services

Service Analyst

- Assists with tier 3 support for issues related to tenant deployed services
- Monitors and analyzes service performance, availability, usage, and other operational analytics
- Makes sure the NOC is able to proactively support released services

Service Administrator

- Provides tier 3 cloud service offering support

IT Business Management Considerations

Organizations need a mechanism for measuring the business benefits of cloud operations. The IT Transformation Dashboard is a common approach, presenting a set of key performance indicators (KPIs) in an easy-to-understand dashboard format. The dashboard should be distributed on a regular schedule to encourage cloud stakeholders to compare relevant KPIs over time and use these metrics as a common language for interactions within the organization.

Key performance indicators (KPIs) such as frequency of interruption and mean time to repair provide visibility into the value of proactive incident and problem management to the organization and guide continuous process improvement. The following metrics are of particular relevance to proactive incident a nd problem management.

Frequency of Interruption

A number of metrics such as application response time, unscheduled and scheduled downtime, and frequency of security breaches feed into this KPI. Service interruptions result in higher IT staff costs, lost employee productivity, and lost revenue due to system unavailability. Reducing the percentage of higher severity tickets is particularly important to realize the full benefits of a proactive system.

Mean Time to Repair (MTTR)

Defined as the time from the fault occurrence to its repair, this KPI provides a good measure of how quickly IT responds to problems occurring in managed systems. As MTTR shrinks, application availability and productivity increase. This KPI can also be an indirect measure of investment in innovation, since IT resources reclaimed from break-fix activities are often redeployed to more strategic initiatives.

Total Downtime per Application

Total downtime per application is an important measurement of the cloud that directly relates to user and IT productivity. It consists of two components, planned and unplanned downtime. Proactive incident and problem management shifts the ratio of these two components—decreasing the unplanned downtime in favor of planned downtime—and also decreases the total downtime per application significantly.

Technology / Tool Considerations

An important aspect of cloud operations is establishing the right tools and technologies to support the process. Unlike other cloud operations capabilities, proactive incident and problem management represents a blend of legacy monitoring tools integrated with intelligent analytics.

Legacy Monitoring Tools

All data centers today employ a variety of tools to monitor performance, capture events, and log data from servers, storage systems, network components, and other equipment. They generate the metrics that are interpreted by IT managers. These metrics are the input to the intelligent analytics system that lies at the heart of proactive incident and problem management. Therefore, most if not all of these legacy tools can remain in service, maximizing the value of existing investments.

Intelligent analytics

Intelligent analytics continuously assess the thousands of performance metrics and available capacity across the entire IT stack, considers relevant business and physical constraints, and drives the necessary actions to tune and maintain the environment in an optimal operating state. Instead of relying on component-level information, intelligent analytics assure the quality of business services and improve the user experience while utilizing the cloud platform as efficiently as possible. Intelligent analytics and control keeps the environment in a healthy state, in essence, preventing incidents from becoming problems. This approach optimizes service performance, maximizes infrastructure efficiencies, and reduces operational costs.

Instead of raw events, analytics consume the raw metrics created by the monitoring tools throughout the infrastructure—legacy monitoring tools can remain in service as long as they can provide information in the required format. Correlating metrics from a number of tools, analytics can identify trends that help to pinpoint potential problems early and allow corrective action before problems occur. For example, an analytics tool could predict that an application will run out of disk swap space in two hours. Armed with this information, IT technicians can take corrective action well in advance of any impact to users.

Key Success Factors

Proactive incident and problem management enables an organization to fully capture the efficiency, agility, and reliability benefits of cloud computing. Experience suggests the following key success factors.

Align on a Clear Objective at the Executive Level

While proactive incident and problem management involves a great deal of tactical activity, establishing its strategic goals is important for a successful deployment. Executive sponsors need to agree on the objective for implementing a proactive system within the organization. This clear objective will aid in making many of the decisions outlined within the implementation section and prevent confusion and disputes within the company. For example, if the sponsors decide that the main goal is to drive higher levels of availability, they can emphasize the ability of proactive management to anticipate and address problems before they occur.

Start with a Pilot Program Running Parallel to the Existing System

Proactive incident and problem management represents a fundamental shift in the way that IT ensures system availability and controls operating expenses associated with troubleshooting and repair. Therefore, the recommended rollout plan is to initiate a small-scale pilot implementation of proactive incident and problem management in a cloud environment while continuing to use the existing system (for example, help desk, tiered support, or integrated management). IT managers can compare the two systems to determine the effectiveness of the forecasting capabilities of the proactive system. As the IT staff develops its ability with and trust in the proactive approach, the legacy system can be phased out without impacting reliability.

Educate Business Leaders on Benefits of Proactive Management

In its emerging role as a service broker, IT must continually educate business leaders on new capabilities and features of the cloud infrastructure. In one sense, proactive incident and problem management is "behind the curtain," in other words, an implementation detail that may not be of primary interest to business users. However, it is worthwhile to meet frequently with business leaders to explain how the proactive system will increase SLA compliance and improve the user experience, while reducing IT operating expenses. By establishing a level of transparency, this kind of outreach from IT fosters the partnership between business units and IT that is essential for long-term success in cloud operations.

Next Steps

Once an organization has decided to implement proactive incident and problem management, a number of steps are necessary.

Establish Prerequisites

The first step IT leaders need to take before implementing proactive incident and problem management is to evaluate whether the correct prerequisites are in place or in progress. Monitoring tools must be deployed to provide raw metrics on performance and capacity. Clear objectives for the proactive system need to be articulated and communicated to architects and designers. Finally, the required funding must be allocated.

Determine Degree of Change Needed

Once progress on the prerequisites is underway, IT leaders should assess the current state to understand the degree of change required across the processes, organization, and tools and technology. As it relates to process, they should understand the impact of proactive incident and problem management on the various IT functions such as help desk, system administrators, and front-line IT managers as well as the additional organizational considerations described earlier.

Shift the Internal Focus from Tickets to Business Value

When organizations are in a reactive mode, the thinking among business users and IT staff alike revolves around tickets, with voluminous reports detailed the number and severity of open tickets, the time to resolve, and other ticket-related metrics. In contrast, a proactive system manages for efficiency, agility, and reliability—value factors that directly affect productivity, competitiveness, and cost. As the organization prepares to move forward with a proactive incident and problem management system, all stakeholders should be educated about this shift in focus in tangible ways, for example, walking through the IT transformation dashboard.

Prepare the IT Organization for Change

IT leaders should test the waters to see how ready their own organization is for the change to a proactive system. IT managers must communicate clearly to staff the rationale for the change and provide visibility into the impact on individual job responsibilities. It is particularly important that managers discuss any planned reallocation of staff based on reductions in troubleshooting time to alleviate fears of staff reductions.

Why VMware for IT Transformation?

The move to the cloud is a foregone conclusion for many organizations today, but the path forward is often unclear. What is the current state of my infrastructure? How do we begin to move forward? What are the right technology choices for implementing our cloud? Most importantly, who can help us achieve our goals?

VMware has built some of the largest and most successful public and private clouds in the world. Now VMware is using that experience to bring to market a complete solution that includes a full suite of software products as well as the services you need to gain the maximum benefit from cloud computing. This combination of software and expertise, delivered via services and education to customers of all sizes across all industries, is unique to VMware and its global ecosystem of partners.

To learn more about the VMware cloud solution, visit www.vmware.com/cloud

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