Datacenter Operational Excellence Through Automated Application Discovery & Dependency Mapping

TECHNICAL WHITE PAPER

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Table of Contents

Introduction

In recent years, a "perfect storm" of forces has come together to radically transform the way IT operations looks at itself and conducts itself on a daily basis. These forces include:

- **IT complexity**—Years of growth and expansion have created an unprecedented level of IT complexity, as applications, servers, and their configurations interact and interrelate with each other like never before.
- **Change management**—IT operations has responsibility for so many networked servers and applications—and the IT environment now changes so often—that they can't be managed effectively using manual processes (which are still common in many organizations).
- **Resource allocation**—These challenges can't be overcome by simply throwing money at them because budgets aren't what they used to be (and aren't determined in the same way, either). IT operations increasingly must deliver new IT services with the same—or shrinking—headcount. "Do more with less" no longer represents a lofty, long-term goal or a theoretical exercise to fill an agenda slot at an offsite planning meeting. For IT organizations that survived the bursting of the dot-com bubble almost a decade ago, that mantra has become the norm.
- **Increasing expectations**—Business expectations of IT operations also changed dramatically. The business no longer perceives the IT organization solely as a cost center that hinders profit margins. It expects IT operations to serve as its strategic IT partner, delivering IT services that facilitate change, enhance business flexibility, and improve competitive positioning—in short, enabling the business to take advantage of new business opportunities more quickly. Gone are the days of the "blank check" when IT implemented technology its way, as it saw fit.

These forces have combined to shape a new, emerging reality for IT operations—the need for continuous IT operations excellence in datacenter environments. Business expects it; rapidly shifting IT forces demand it—and you have to deliver it.

Datacenter operational excellence doesn't spontaneously happen on its own. To make it a reality, you need accurate, up-to-date data that you can use to underpin effective decision making, as well as enhance and improve processes and efficiencies. Without that information, you will likely make less-than-perfect decisions that place your business at risk.

Getting this data isn't easy. The task itself can be so daunting that you may not know how—or where—to start. Information infrastructures tend to be large and distributed, which makes the task large and complex. And numerous data integrity issues can stand in your way, including the following:

- **The data may not even exist**—forcing you to initiate an inventory project.
- **The approach carries significant risk**, hindering the ability to leverage existing sources of information such as an asset management database. If the data hasn't been updated recently, its value is extremely low—even if you're leveraging it from another source, rather than recreating it or capturing it from scratch.
- **Manual inventory processes are prone to error.** The effectiveness of every operational process and system that relies on data gathered manually is, by extension, suboptimal and a risk to the business.
- **The data you want changes quickly.** Application environments are highly dynamic. Worse, the pace and rate of IT-related change, which has accelerated tremendously in recent years, is only getting faster. And virtualization—a tremendous tool for reducing costs, increasing efficiency, and allowing IT to provide the business with improved business agility—only accelerates the rate of change. For processes or systems that rely on manual data gathering—or even periodic (usually weekly) inventories using automation—the data is probably outdated and the dependent processes and systems compromised soon after the information is gathered.

The traditional way of gathering this critical data, such as manual, periodic audits, simply doesn't represent a viable option to IT operations anymore. There's too much information to track this way. To ensure viable and useful data, a manual-audit approach in today's IT environments would require dedicating a tremendous number of people to gather, verify, and validate the data in a timely manner that meets the needs of the business. Costs would be astronomical and almost impossible to justify. In addition, these skilled IT resources should be focusing on more important projects and services that add value to the business.

Datacenter operational excellence—and, because of the critical role applications play in supporting the business, effective IT service delivery and business success—stems from making well-informed business decisions. And you cannot effectively make those decisions—and know you've made the right call—without having accurate, up-to-date data that one can analyze and act upon.

The prescription for getting that valid, up-to-date data you need is:

- Eliminate error-prone manual data-gathering processes you may have
- Stop doing periodic audits—things change too rapidly
- Continuously monitor the environment to have awareness of changes and ensure valid data

Achieving Operational Excellence and Delivering Results

In short, to ensure datacenter operational excellence, you need to automate your application discovery and dependency mapping, and do so on a continuous basis. By simultaneously taking a continuous approach and leveraging the power of automation, you can:

- Reduce costs by eliminating personnel hours associated with manual inventory and related processes
- Discover everything — including that which you don't know about
- Improve efficiency by:
  - Eliminating problems associated with bad data gathering by rooting out the problem at the source—that is, getting rid of manual processes that caused the bad data in the first place
  - Assign skilled, critical IT personnel to projects that add value to the business—because they no longer have to do this kind of work manually
  - Have reliable data with which to make better, correct, informed decisions
  - Spend less time being reactive and more time being proactive
  - Put the right information into the hands of those who need it—providing better service to the business (such as the help desk function)
- Improve IT service delivery
- Provide more flexibility to the business
- Determine the impact of proposed changes in the environment by modeling them before actually making the changes—so your changes don't introduce problems the production environment (change management)
- Provide a rich source of data and information that can be leveraged as the "source of truth" for:
  - An up-to-date CMDB or CMS—federate this data in real time to a CMDB or CMS
  - Helping to ensure IT compliance (in conjunction with other tools and solutions that help ensure IT adherence to compliance and governance)

Approaches to Automating Application Discovery & Dependency Mapping

Effective application discovery and dependency mapping requires three primary methods:

- **Active discovery**—This method uses common network protocols to remotely query servers in the managed network and obtain supplementary CI data about network hosts. However, using just active discovery can place an unnecessary burden on the network. In addition, large segments of CI data don't change all that often, making repeated realtime active discovery unnecessary for many. Furthermore, although active discovery uncovers detailed CI data about hosts and services, it doesn't easily or directly provide information about how they relate to others. But active discovery doesn't require agents, and delivers a wealth of solid CI data.

- **Passive discovery**—This method provides more of that relationship data. By connecting to core span or mirror ports on network switches and sampling network traffic, passive discovery can identify network hosts and servers, their communications and connections, and what services and protocols are being exchanged at what time. Although another rich source of data, you need some additional capabilities to assemble this raw data into actionable information.
- **Discovery analytics**—This third element complements the first two with the ability to perform deep-packet analysis of observed traffic, and to help establish the relationships between passively and actively discovered entities. Analytics with rich data provides little benefit; the same holds true for active and passive discovery.

Together, active discovery, passive discovery, and discovery analytics deliver a hybrid approach to application discovery and dependency mapping—provides the most complete approach

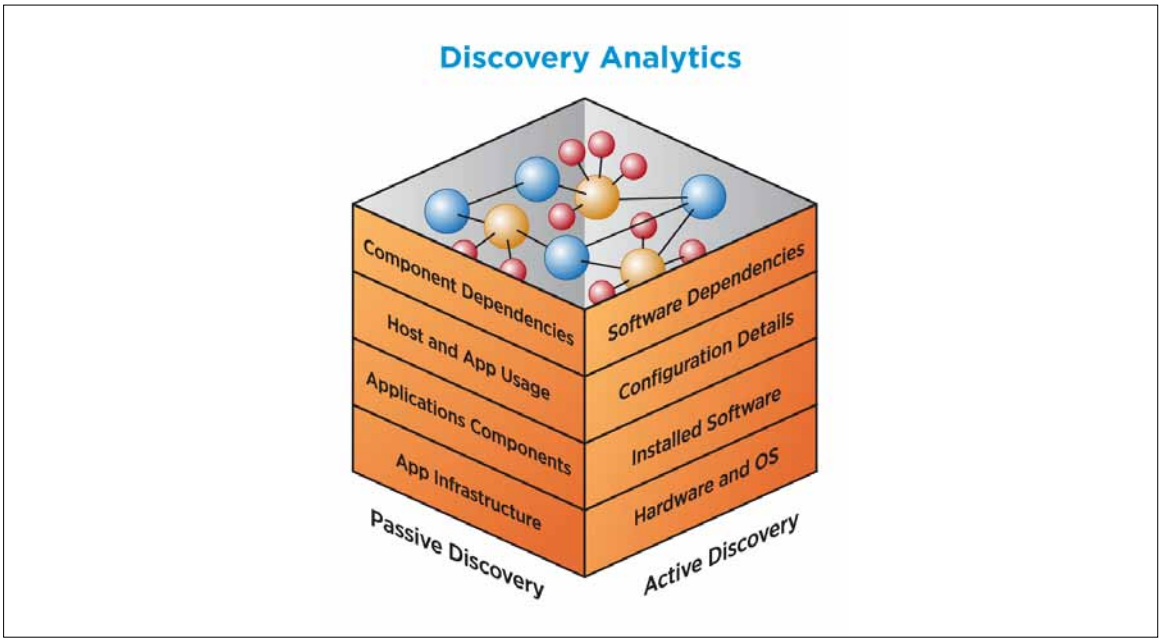

Figure 1: Only a Hybrid Approach to Automated Application Discovery Can Provide the Information Needed to Manage VMware Environments Effectively

This hybrid approach allows you to continuously and passively track application dependencies, demand, usage, service levels, and change events. With passive discovery, you uncover the rich relationship data you need. A hybrid approach allows you to continuously and passively track application dependencies, demand, usage, service levels, and change events, and determine impact analyses. It also enables you to discover the entire application infrastructure, and visually map all resources and dependencies. In turn, this allows you to manage more effectively by having a thorough understanding of relationships, impact, change and configuration, demand, usage, and service levels.

Imagine driving along a twisting country road at night and only illuminating your headlights for a few seconds each hour. Between these hourly flashes, the road is invisible. You probably wouldn't put yourself in such a risky position.

However, this is analogous to what you're doing if you rely solely on active discovery at selected intervals to provide you with the information you need to manage IT service delivery over a virtual infrastructure. You're driving blind most of the time, risking IT service delivery and your virtualization efforts—and, most importantly, business operations—on sporadic flashes of illumination, rather than always driving with your lights on.

With the combination of benefits delivered through a hybrid approach to automated application discovery, you always have enough light to see the road ahead of you.

Use Cases for Automating Application Discovery & Dependency Mapping

You can leverage realtime, automated application discovery and dependency mapping capabilities to deliver value to many critical IT operations functions and processes.

CMDB/CMS Population

Automatically discover configuration data about servers, applications, system infrastructure and their dependencies, and federate this information to a CMDB or CMS. In addition, automated application discovery and dependency mapping also provides the relationship data that is required for any proper CMDB or CMS implementation. A CMDB or CMS without dependency mapping is just an inventory database.

Change and Configuration Management

By understanding the relationships between applications and the underlying infrastructure, you control the most critical change management function by being able to determine the impact of a potential IT change—before you make the change. IT research indicates that about 80 percent of IT service failures stem from poor change management processes and configuration changes made with regard to their impact.

Typically driven by "tribal knowledge," the increasingly complex IT environment demands rapid change. You need to understand how changes cause problems and how to prevent these change-related problems. You need to determine the impact of changes on services before you make the change. With automated application discovery and dependency mapping, you have the information that is requisite for operational excellence in this critical capability.

Datacenter Consolidation, Capacity Planning, Business Continuity Planning, and Application Migration

Automated application discovery and dependency mapping can deliver tremendous value when applied to projects related to datacenter consolidation, capacity planning, business continuity planning, and application migration. All of these projects have one common requirement: a deep, thorough understanding of how servers, applications, and infrastructure work together and relate to each other.

With automated application discovery and dependency mapping, you get that capability—whether its establishing a baseline asset inventory before a datacenter consolidation, ensuring a new application rollout doesn't impact legacy architectures in unexpected ways, or understanding of how the servers, applications, and infrastructure work together so you can deliver application services right away when recovering from a disaster. You know what applications are involved, how they are delivered, and what business services and users will be impacted by a proposed change or move.

Furthermore, by leveraging automation for application discovery and dependency mapping, you save tremendous amounts of money that would have been spent dedicating personnel hours—even worse, likely using highly skilled IT personnel—collecting and analyzing this data. And in the end, you'd still have risk with manual application discovery and dependency mapping because manual processes done by people are extremely prone to error.

In addition, by having automated application discovery and dependency mapping capabilities, these kinds of activities start to move away from being one-off projects, and become properly positioned to move toward being ongoing operational processes. Moving away from reactive, project-based approaches to proactive, process-based approaches for these kinds of activities, IT operations moves that much closer to achieving operational excellence—the data provided by automated application discovery and dependency mapping provides the key linchpin necessary to continuously improve these types of activities, rather than simply react when the need arises.

Virtualization Management

Automated application discovery and dependency mapping supports IT operations before and after a consolidation and virtualization effort by automatically discovering all of the critical dependencies that exist among your applications and your information infrastructure.

Before virtualization, automated application discovery and dependency mapping augments your virtualization plan by determining the key dependencies that exist between applications and their physical hosts. For example, automated application discovery and dependency mapping could identify a critical dependency between an application and database that could reduce overall network traffic. To maintain proper levels of performance after virtualization, IT operations could then ensure the application and database remain on the same server for greater efficiency.

By using automated application discovery and dependency mapping to identify critical dependencies between applications and servers before consolidation and virtualization occurs, you have a smoother transition to virtualization while ensuring the delivery and performance of IT services.

After consolidation and virtualization, changes occur rapidly in the new environment. Automated discovery and dependency-mapping information also helps IT operations by ensuring ongoing performance and improvement. This dependency information can help you identify potential application-related performance bottlenecks and reduce unnecessary network traffic. Automated application discovery and dependency mapping helps you deliver on the promise of virtualization by allowing you to optimize the performance of critical IT applications and services.

Problem Management and Analysis

One of the first questions most problem management troubleshooters ask is "what changed?"—and with good reason. The vast majority of IT problems stem from changes.

Automated application discovery and dependency mapping provides that vital change management capability by tracking what has changed in the application environment. In addition, by serving as the source of truth for providing CI data—including dependencies— automated application discovery and dependency mapping provides a rich repository of accurate, up-to-date information to help IT analysts identify problem patterns over time.

Furthermore, the data captured through automated application discovery and dependency mapping allows you to more easily correlate infrastructure incidents to application impact. But putting that information in an IT analyst's hands could be just the beginning when it comes to operational excellence. By integrating an automated application discovery and dependency mapping capability with an automated root-cause analysis and incident management system, IT operations can more rapidly speed service restoration because personnel aren't troubleshooting by manually analyzing the data. Instead, they can more proactively monitor how infrastructure issues impact application availability and performance. In short, application discovery and dependency mapping enables IT operations to make more efficient problem management decisions.

Compliance Management

Avoiding failures and downtime is one side of change management. Conforming to IT and regulatory policies is another side that often is just as important. Here are some common questions that must be answered:

- What configurations are allowed?
- What applications can talk to what applications?
- Over what protocols?
- Do they need to be secure?
- Which servers are allowed to talk to other servers?
- Can you log and track behaviors, configurations, and changes to these?

Automated application discovery and dependency mapping can support these efforts. The rich repository of data captured this way can allow you to leverage this information as a trusted data source form more insightful analysis, as well as automated IT policy monitoring and alerting.

The VMware Approach to Application Discovery & Dependency Mapping

VMware vCenter™ Application Discovery Manager delivers all the critical capabilities needed to support operational excellence through application discovery and dependency mapping. As an automated solution, you eliminate manual processes. As a real-time solution, you're able to stay ahead of the paid pace of change in the IT environment. By continuously monitoring, you know right away when changes happen, and you always have valid, up-to-date data to support key operational processes and initiatives.

The discovery and dependency mapping capabilities in Application Discovery Manager stem from a unique hybrid approach that combines the strengths of passive and active discovery with detailed, model-based analytics.

With Application Discovery Manager, IT operations gains the trusted data source its needs to achieve operational excellence, as well as:

- Enhance processes related to change, configuration, incident, and problem management, and improve service-desk effectiveness
- Identify and manage change impact and compliance issues
- Control configuration drift
- Enrich a CMDB or CMS with accurate, realtime configuration and dependency data
- Collect and analyze detailed CI and dependency data—without using server-side agents
- Create custom reports of discovery data using new external reporting database capabilities
- Ensure ongoing performance and improvement in VMware environments by optimizing critical IT applications and services
- Deliver foundational data required for ensuring IT compliance, datacenter consolidation, capacity planning, business continuity planning and application migration

In short, you can't manage what you don't know. And you can't achieve IT operational excellence with critical configuration and dependency information. By delivering clear line of sight into your datacenter, Application Discovery Manager provides that key data that allows IT operations to move away from proactive firefighting, and puts it on the path to achieving operational excellence and providing proactive business value creation.

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