

# SKILLZ

TO MASTER YOUR VIRTUAL UNIVERSE

# 4 SKILLS TO BECOMING THE MASTER OF YOUR VIRTUAL UNIVERSE

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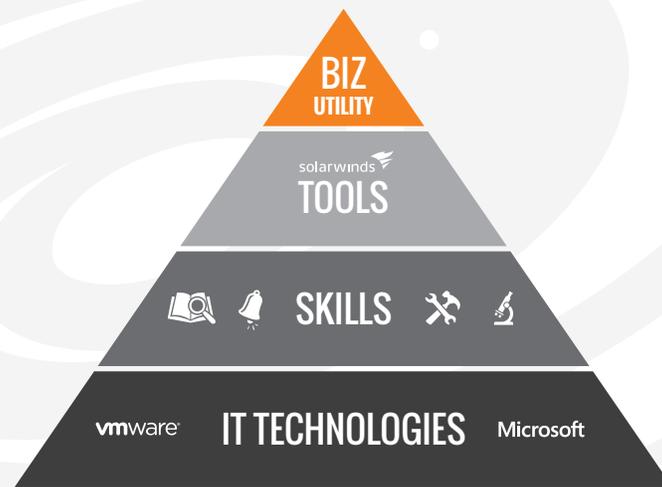
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## INTRODUCTION

# VIRTUALIZATION EXPLAINED IN A NEW WAY

“Just as setting any object in motion requires overcoming the greatest force of friction, the toughest step in any journey is getting started.”

One can justifiably say that virtualization is a mature technology. It has formed the basis for Cloud computing, and it epitomizes the continuous service delivery and consumption model that beckons in the era of IT-as-a-Service (ITaaS). For the most part, the benefits of virtualization, such as high availability, virtual machine (VM) mobility, and consolidation, have been thoroughly documented and are valued by businesses of all kinds.



Be the tip of the spear: Learn like your career depends on it.

Unfortunately for some IT administrators, virtualization might not be a primary responsibility. Without the opportunity to learn and gain experience as part of their daily routine means these admins are getting a late start in the virtualization game. So why should IT admins, who don't consider virtualization to be a critical part of their job description, care about virtualization? Because virtualization spans every data center construct from servers to storage to networking to security operations. Add in the fact that it is used in practically every IT shop and you have a perfect IT storm. So while you might have been hired to administer one of those systems, virtualization's dependency and abstraction of those resources means you'll need to bridge the virtualization knowledge gap.

“Think of virtualization like living in an apartment.”

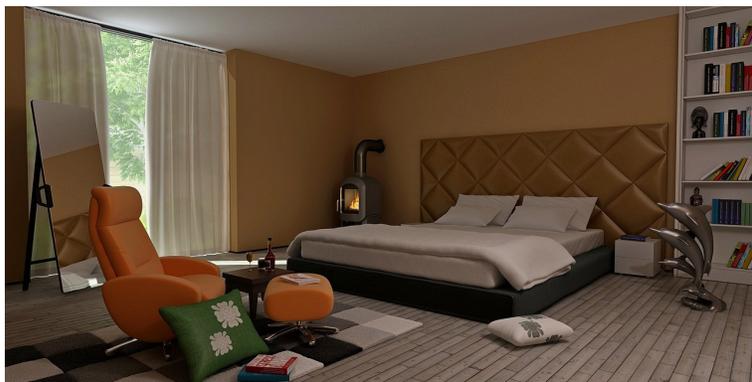
The confluence of a mature technology, lack of experience, and a late start means that much of the current documentation and learning materials are not tailored for you, the “voluntold” virt admin; instead, they’re written with the assumption that you already have some level of virtualization experience.

Just as setting any object in motion requires overcoming the greatest force of friction, the toughest step in any journey is getting started. Your current approach to learning virtualization might be akin to throwing darts at a dart board (aka chuck and duck) in the hopes that something might just stick and resolve any issue that arises. But as you’ve probably observed and verified, that’s rarely the most efficient or effective way to do things.

### **THIS IS VIRTUALIZATION IN A NUTSHELL:**

Let’s start by untangling virtualization and discuss why it’s become a necessary aspect of practically any IT department. I was once asked, “How would you explain what virtualization is to your grandmother?”

Think of virtualization in terms of living in an apartment. Let’s say you sign the lease on a two-bedroom, two-bathroom apartment. That’s a lot of unused resources for just one person, so you add a roommate. Now the utilization of the apartment has doubled and the monthly cost to you has been cut in half. To save even more money, you add two more roommates. Now you are paying a quarter of the total rent, but the trade-off is that sometimes there is contention for shared resources, like the kitchen, the living room, the bedrooms, or the bathrooms.



The electricity sometimes goes out, so you come up with an agreement with other friends in a similarly configured apartment in a different apartment building, which allows you and your roommates to move between the two apartments should one apartment become unusable or overcommitted. Also, if you find out that you get along better with certain roommates, you can change roommates to maintain the most agreeable roommate arrangements.

“That is virtualization in a nutshell: Consolidation and availability of resources to enable cost savings and data center utilization efficiencies.”

So, Grandma, that is virtualization in a nutshell: Consolidation and availability of resources to enable cost savings and efficient data center utilization.

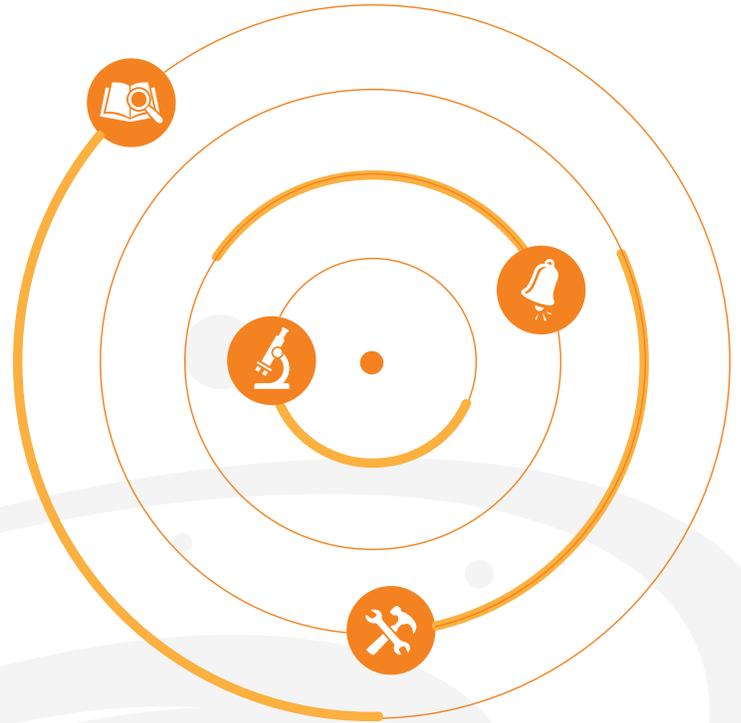
## UNDERSTANDING THE BASIC VIRTUALIZATION CONSTRUCT IS KEY, BUT YOUR SKILLS ARE WHAT WILL GET YOU PAID.

So what skills do you need in order to successfully walk the walk of a virtualization administrator? The following four skills make up a straightforward framework that will get any virtualization admin up to speed in no time:



These four skills represent what a virtualization admin would be responsible for on any given day. Master them and the virtualization universe is yours to control, maintain, and scale — just like your IT career.

# MASTER THESE DEFINITIONS



## DISCOVERY

**Find out what's going on.** This simple principle should guide you in understanding the health and risks of your virtualized assets, such as VMs, datastores and virtual hard disks. Discovery begins by establishing a point-in-time baseline for the health and risks of your environment. Once you understand what's in your environment and each component's health and risks, you should look at addressing changes that occur in the environment—especially systems that can break or situations that can lead to slow applications, which, in turn, leads to poor end-user experience.



## ALERTING

**Find a simple way to know when something breaks.** The essence of this skill is to ensure that you're not constantly in front of a monitor because, frankly, no one has time for that. The noise should be filtered from the signal such that only the most important information is presented to you. The information that's highlighted should allow you to take corrective actions on a much narrower problem set. As you gain more experience, you'll be more adept at creating more meaningful alerts to bypass even more noise.



## REMEDIATION

**Fix the problem.** The core principle is to get the data center in working order as fast as possible. For a virtualization admin, this is a race against time. Every minute an application or system is down equates to lost opportunity, and often, lost revenue. Admins get paid to fix complex problems, and the very best of us fix issues using the most simple and straightforward means, which adds no additional overhead to virtualized environments.



## TROUBLESHOOTING

**Find the root cause.** Your focus should be on solving the right problem instead of chasing false positives or waterfalls. Being able to quickly uncover the root of a virtual environment problem translates to being able to remediate it that much faster. This will provide you with a lot of experience, but it can also keep you in the data centers at night and on weekends.



# DISCOVERY OF YOUR VIRTUAL ENVIRONMENTS

**YOU DON'T KNOW  
WHAT YOU DON'T  
KNOW**

### **DISCOVERY: FINDING OUT WHAT'S GOING ON.**

This simple principle should guide you in understanding the health status and risks of your virtualized assets, such as VMs, datastores or virtual hard disks, and virtual networks. Discovery begins by establishing a point-in-time baseline for the health and risks of your environment. Once you understand what's in your environment, each component's health and risks, and their connection to the applications and services you support, you can start managing the changes that occur in your environment. This is especially true for systems that can break, or situations that can lead to slow applications, which, in turn, leads to poor end-user experience.

### **WHY DISCOVERY IS IMPORTANT**

Discovery serves three key functions in a virtualized environment. You need to:

- 1. IDENTIFY ALL OF YOUR VIRTUAL ASSETS AND RESOURCES ACROSS ALL OF YOUR DATA CENTERS AND SHOW THEIR CONNECTED CONTEXT.**
- 2. PROVIDE A POINT-IN-TIME BASELINE FOR THE PERFORMANCE AND RISK OF YOUR DATA CENTER THAT CAN BE LOGGED FOR TREND LINES AND ANALYZED FOR ANOMALIES AND OPTIMIZATION OPPORTUNITIES.**
- 3. POPULATE THE DATA USED TO CALCULATE DATA CENTER EFFICACY EQUATION: HOW EFFICIENT AND EFFECTIVE IS YOUR IT IMPLEMENTATION VERSUS YOUR IT SPEND?**

“The trade-offs that need to be considered with the discover skill involve frequency, time, and resources.”

These three functions map to three use cases. The first function is used as the first measure of control against the dreaded shadow IT. Shadow IT is used to describe IT systems and solutions built and used in organizations without the IT organization's approval, rigor, and due diligence applied. According to Gartner's Hank Marquis, 28% of IT spend occurs outside of the IT department. A separate report from IDC projects that number to increase by 5% over the next five years.

The second function is all about revealing the health status and risks in your virtual environment. When combined with the first function, it is the perfect counter to resource sprawl. It also helps with capacity planning and right-sizing your resources. This improves your data center efficiency (ROI for you business-savvy techies), and eliminates potential security holes. Essentially, your virtual data center can support more VMs and applications while delivering acceptable Quality-of-Service (QoS). When you add it up, your IT department will save money and mitigate potential security risks.

The third function bridges IT and business operations with utilization data on operating efficacy, and allows dollars to be assigned around efficiency and effectiveness. Operational efficacy is defined as how effective and efficient your data center is running relative to your architectural design, resource allocation, and application landscape.

## DISCOVER THE PROCESS AND PAIN

The discovery process is straightforward. You'll need a virtualization management tool that maintains a record of the virtual data center environment, including an enumerated list of VMs and their data stores along with the physical resources they depend on. (These physical resources include the host servers and the storage constructs.) Next, you need to utilize tools that enable virtual machine monitoring and logging to establish baselines and form trend line behavior of the data center environment. Schedule routine scans to keep the record up to date, and add data points to your data center trend line. This skill can be used from a service granularity through an entire application stack and across the entire data center environment.

Trade-offs that need to be considered with discovery include frequency, time, and resources. Discovery consumes resources and time since it has to scan across your entire data center to get the up-to-date info on your infrastructure, especially if you have a large data center ecosystem across multiple providers. Then, you may have to manually compile and create the list to see what resources have been added or removed. In addition, the discovery cadence should factor in your IT ops schedule, which includes the maintenance window, integration and build-out, and day-to-day operations to minimize the overall disruption to your production environment.

“Discovery is the first step to becoming a master of virtualization. It takes the guesswork out of your day-to-day.”

This effort is just to get the working data set for virtual assets. Analysis is required to determine sprawled resources or shadow IT assets. This might materialize as a simple difference of two lists of VM assets. But it can grow exponentially complex, especially with the dynamic nature of VM resource properties. The performance data provides more data to sift through to support your governance efforts, as well as providing the basis to troubleshooting and remediating any application bottlenecks that may arise.

## **REAL-WORLD USE CASE: VM SPRAWL**

VM sprawl is when you have unused and no longer needed objects in your virtual environment. VM sprawl can occur through the scale and agility of automated and orchestrated workflows that enable rapid provisioning or through processes that transfer the VM rights to the end-user outside the purview of IT. Whatever the case, VMs and virtual assets that no longer perform meaningful work need to be decommissioned to free up the physical resources and to close any potential security risks.

## **REAL-WORLD USE CASE: SHADOW IT**

Shadow IT is used to describe any IT services that are procured and used outside the IT processes. Think of a credit card or any Infrastructure-as-a-Service (IaaS) or Software-as-a-Service (SaaS) provider. Shadow IT usually spawns from IT's perceived inability to meet the speed that the business needs. What it introduces are compliance issues that makes it more difficult to comply with Sarbanes-Oxley (SOX) Act, Federal Information Security Management Act (FISMA), Payment Card Industry Data Security Standard (PCI DSS), and Information Technology Infrastructure Library (ITIL) to name a few. But organizations have also used shadow IT to innovate and reduce cost. Unfortunately, IT cannot use this as an excuse to ignore shadow IT. Instead, it is an opportunity to add value, IT rigor, and process to shadow IT.

Discovery is the first step to becoming a master of virtualization. It takes the guesswork out of your day-to-day. Plus, only high levels of management in your organization can claim plausible deniability as an excuse.

## STEPS TO IDENTIFY AND ELIMINATE VM SPRAWL.

1. USE A PERFORMANCE MONITORING TOOL TO CAPTURE VM UTILIZATION DATA ACROSS KEY METRICS LIKE CPU, MEMORY, DISK, AND NETWORK.
2. USE A LOG EVENT MANAGEMENT TOOL TO CAPTURE AUTHENTICATED LOGIN AND REMOTE ACCESS ON VMS.
3. IF THERE IS NO UTILIZATION AND NO AUTHENTICATED ACCESS OVER AN EXTENDED PERIOD OF TIME (MULTIPLE DAYS OR WEEKS OF NO USAGE OR NO LOGIN), THEN THAT VM IS A GOOD CANDIDATE FOR DECOMMISSIONING AND RECYCLING ITS RESOURCES BACK INTO THE RESOURCE POOL.
4. THIS SAME METHOD CAN BE APPLIED TO CLEAN UP ORPHANED SNAPSHOTS.

## STEPS TO IDENTIFY AND GOVERN SHADOW IT.

1. IF YOU CAN GET ALL THE LOGIN CREDENTIALS, THEN YOU CAN SIMPLY EXPORT THE ASSET LIST FROM MOST OF THE CLOUD SERVICE PROVIDER'S MANAGEMENT CONSOLE.
2. IF YOU CAN'T GET ALL THE CREDENTIALS OF SHADOW IT USERS, THE IT DEPARTMENT SHOULD MONITOR TRAFFIC TO AND FROM THEIR DATA CENTERS AND ON THEIR NETWORKS.
3. HAVE A CONVERSATION WITH BUSINESS UNITS TO FIND COMMON GROUND ON INNOVATION AND IT GOVERNANCE.



# ALERTING IN YOUR VIRTUAL ENVIRONMENTS

**CUT THROUGH THE NOISE, AND FIND THE SIGNAL THAT MATTERS**

To truly appreciate the importance of alerting, you have to understand the pain that comes with incorrect alerting. Alerting starts with monitoring, which is an important aspect of discovery. The data from systems, VMs, and applications being monitored can provide valuable insights into the data center's ecosystem, but that data can easily overwhelm the virtualization admin. A constant stream of false alarms and data noise can result in paralysis by over-analyzing thresholds. Suffice it to say, when it comes to alerting, more isn't always better.

### **ALERTING: FIND OUT WHEN SOMETHING BREAKS**

The essence of skillful alerting is ensuring that you're not constantly in front of a monitor, because, frankly, no one has time for that. The noise should be filtered from the signal in such a way that only the most important information is presented to you. The information that's highlighted should allow you to take more efficient corrective actions on a much narrower problem set. As you gain experience, you'll become more adept at creating meaningful alerts to bypass even more noise. This will save you time, help you avoid wild goose chases (aka, false positives) and generally make your life easier.

In addition to cutting through the metrics noise and data deluge, alerting serves two other critical functions:

- Records that a particular event has occurred, or a threshold has been reached or exceeded.
- Triggers a notification to a virtualization admin for that given event.

Alerting provides the first clues that an event is about to happen, is happening, or has happened. It guides the first steps on the path toward troubleshooting and remediating an event.

“Using a virtualization management tool that enables the process through the alert lifecycle while cutting through the extraneous noise is key to alerting success.”

## ALL QUIET ON THE ALERTING FRONT

Skillful alerting is grounded in defining and refining the key metrics, important events, and thresholds for the VMs, resources, and applications that are most critical to your organization's success. Using a virtualization management tool that enables the process through the alert lifecycle while cutting through the extraneous noise is critical to successful alerting.

With the proper alerting set up, you can efficiently monitor and quickly surface issues that may cause downtime. A proper tool will save you time in the alert lifecycle as you troubleshoot and remediate issues. It does this by keeping the application stack in context while surfacing key events and trends in metrics prior to the incident that caused your application to slow or go down.

The alert lifecycle spans three primary stages: alert creation, alert handling and routing, and alert feedback.

- **Alert creation** means deciding on key health and performance indicators and setting thresholds for those indicators. Data and analysis generated from the discovery skill can seed the initial alerts. Common virtualization alerts that you should set up include CPU and memory utilization on the hosts and VMs, storage and network latencies and IOs per second (IOPS), and application-specific alerts.
- **Alert handling and routing** necessitates creating a meaningful notification in response to the alert trigger, and communicating that alert to the right person who can take the proper action to prevent or resolve the issue. These notifications can include emails, SMS messages, or automated calls to cellphones.
- **Alert feedback** involves being able to update alerts based on changes in the VMs, applications, or stack, as well as trigger conditions to ensure the right balance of notification to false alarms in the dynamic virtual environment. Your virtual data center ecosystem changes over time as you add and remove applications, resources, and VMs, so you need to be able to alter your alerts and their thresholds as needed to do your job well.

Alert Name	Message	Triggering Object	Active Time
VM Disk Latency	Read or write latency to any...	tes-rde-01	
Datatore Overallocation	Fires when the total 'provis...	tes-ess-01.LocalStorage02	10m
VM - No heartbeat	No heartbeats are being rec...	sys-2b-2urs	28m
Datatore High Latency	Latency spent by storage fi...	VeeamBackup_LAB-VEEA...	35m
High VM CPU Utilization	CPU utilization of the VM ov...	bas-2b-01	35m
Host memory utilization	Memory utilization of the Ho...	bas-ess-01 lab.tes	35m
VM memory swap	Amount of memory being s...	2b5-01	2h 25m
VM Phanton Snapshot Files	Finds VMSN files on the dat...	NetApp_rh01_tes_ess_01	2h 40m
VM Phanton Snapshot Files	Finds VMSN files on the dat...	tes-ess-02.LocalStorage1	2h 40m
VM Phanton Snapshot Files	Finds VMSN files on the dat...	tes-ess-01.LocalStorage01	2h 40m

Count	Issue Name	Description
87	VMs with Bad Tools	VMs whose tools status is not OK
11	VMs with Connected Media	VMs with connected media is one element that can p...
28	VMs With More Allocated Space than Used	Fires when a VM has more than 1GB difference bet...
50	VMs with Old Snapshots	VMs with snapshots created more than 30 days ago
35	VMs with Large Snapshots	VMs with snapshots using more than 2 GB storage s...
1	VM Memory Limit Configuration	The alert fires when the memory limit is less than the...
26	Inactive VMs - disk	VMs whose VMDK file(s) have not been accessed for...

Category	Issue Name	Description
Categories without issues (13)	Cluster low VM capacity	The alert fires when the predicted number of VMs th...
	Cluster memory utilization	Memory utilization of the cluster
	Cluster predicted CPU depletion	The alert fires when the predicted time remaining unt...
	Cluster predicted disk depletion	The alert fires when the predicted time remaining unt...
	Cluster predicted memory depletion	The alert fires when the predicted time remaining unt...
	Datatore Excessive VM Log Files	Fires when the size of the log files on a datatore ris...
	Disk 100% within the week	The predicted time remaining before this datatore h...
	Guest storage space utilization	Amount of disk space available inside the guest is les...
	Host CPU utilization	CPU utilization of the host reaches 70%
	Host rebooted	Host that has been rebooted within the past 30 minutes

Virtualization alerts should quickly surface key events and trends.

“Alerting declutters the data noise and notifies the virtualization admin of an incident.”

## **ALERTING GIVETH AND VIRTUALIZATION ADMINS NEED NOT TAKETH ALL**

Alerting sets the edge on the number of incidents that are being monitored. This means that you can alert on all the performance counters and events that your virtualization platform supports, but does that really help you fix application performance issues in your VMs, or VMs that stop working? As a virtualization admin, you have to know which counters and events are both relevant and important to the issue at hand.

This is where leveraging a good virtualization management tool comes in. It should have ready-made alerts that cover the most common virtualization issues and events. If you are new to virtualization, you can use these out-of-the-box alerts as starting points on your learning journey. These pre-made alerts should be grounded in well-established virtualization principles. Mastering alerting involves consistently identifying the right alerts in terms of number and types, and knowing how to tailor those alerts to meet your specific IT operational objectives.

A major pitfall of alerting is establishing the right balance between getting visibility into your virtual environment and inundating stakeholders with too many alerts. It could turn into the alert that cried virtual wolf if too many false alarms go out. In order to avoid that situation, virtualization admins should create alerts with connected context. For instance, one might combine multiple thresholds across the stack subsystems of CPU, memory, networking, and storage across a virtual cluster along with application events from a VM into one alert to focus on that specific application.

Alerting is a critical step on the path to becoming a master of virtualization. It declutters the data noise and notifies the virtualization admin of an incident. Ideally, it includes the relevant details about a specific incident in the virtual data center.

In the next chapter, I'll discuss the remediation skill, one of four core skills that virtualization admins need to master.



# REMEDICATION, IT'S HOW YOU KEEP YOUR JOB

## FIX IT...NOW!

### REMEDICATION MEANS FIXING THE PROBLEM

As my fellow Head Geek Thomas LaRock so eloquently stated, "As a systems administrator, you get paid for performance, but you keep your job with recovery." Your job is on the line when \*\*IT happens. The lone objective of remediation is to get back to a working state as fast as possible, no matter what caused the problem. Getting back to a working state could mean fixing things so that they deliver acceptable application QoS, or it could mean bringing VMs and applications back online. Whether it's a service, an application, a VM, or a system, for a virtualization admin, this is a race against time. Every second an application or system is down, or even just slow, means that less work is being done. Employees are less productive, customers are less satisfied, less sales are being recorded, and less revenue is being generated. Because all of these things affect the bottom line, admins should view job security in terms of how fast they can fix these complex problems. The quality of your fix determines your reward.

### \*\*IT HAPPENS - STAND AND DELIVER

All heck is breaking loose in the virtual data center. Tickets are piling up in your mailbox, and most of them are completely indecipherable. Other IT teams responsible for the stack, including those tasked with managing servers, storage, networking, and applications, have gone into blame-game mode and have placed the "X" squarely on the virtualization team. They claim, "Well, it was never slow when it was running on physical." And worst of all, management, adjacent teams, and business owners are breathing down your neck, second-guessing everything that you're doing. (The world is watching and the clock is ticking. Do you cut the blue wire or the red wire?!?)

“It doesn’t matter what you do or how you do it, just do it and get things working again.”

The only thing that matters at this moment is making the world right. It doesn't matter what you do or how you do it, you just have to get things working again. If you can't, you just might be looking for a new job. This is the kind of pressure a virtualization admin in full remediation mode experiences. The very best admins will fix issues using the simplest and most straightforward means, making sure they add little-to-no increased overhead to their virtualized environments.

## **THREE MAGIC WORDS FOR WHEN YOU'RE FEELING (IT) QUEASY**

Take a deep breath and repeat these three magic words: Stop. Drop. Roll. Yes, these are the same steps to take if you're on fire. They work for IT virtualization fires as well.

### **1. STOP.**

- ASSESS THE SITUATION.
- FOCUS ON THE STEPS THAT WILL LEAD TO RESOLUTION.

### **2. DROP.**

- DROP ALL DISTRACTIONS LIKE UNNECESSARY AND UNCONNECTED SERVICES AND PROCESSES.
- REMOVE ALL UNNECESSARY PSEUDO-IT CHEFS FROM THE VIRTUAL KITCHEN. THIS MEANS ANYONE NOT DIRECTLY RESPONSIBLE FOR AND CONNECTED TO THE STACK THAT YOU'RE TRYING TO RESTORE.

### **3. ROLL.**

- ROLL OUT YOUR RECOVERY PLAN TO GET YOUR SYSTEMS, APPS, AND VMS BACK IN WORKING ORDER.
- MONITOR KEY PERFORMANCE INDICATORS TO MAKE SURE THE SYSTEMS AND APPS ARE STABLE FOLLOWING THE FIX.

“Remediation is how virtualization admins will keep their jobs.”

## WHAT MAKES REMEDIATION GOLD?

Remediation is really about rocking that roll phase. Remember, the goal of remediation is to restore your system to a good working state. Leveraging highly available architectures, good backup plans, and disaster recovery techniques are fundamental keys to remediation success.

- **High availability (HA) implementations** allow virtualization admins to absorb some level of degradation or failure while buying time to work on incidents and issues. An example is VMware® HA. When a host server in the cluster fails, the VMs on it will automatically restart on another host server in the cluster. It can even detect guest OS failure and restart the VM on the host server. Leveraging your discovery and alerting skills alongside your HA knowledge of technologies and applications will help you realize your full potential in remediation.
- **Backup plans** are the next line of defense for virtualization admins as they work to minimize the mean time to resolution. The only guarantee in IT is that something will change, and if it changes for the worse, you have to be prepared to deal with it. The key to backup plans is being able to identify the steps in a complete install/deployment that are most time-intensive or most painful to deal with in the event of a failure or disaster. Once you identify these, you can create checkpoints that allow you to start at a point further along in the deployment cycle. Test your backup plan to make sure that it works as designed.
- **Disaster recovery (DR)** brings the systems, applications, or VMs back into working order, using your backup plan as the basis. The better the DR plan and process, the better the recovery rate.

Virtual admins who remediate efficiently and effectively get to keep their jobs. Remediation is the act of going from failure to recovery. Leveraging the skills of discovery and alerting makes a virtualization admin's job easier when resolving any incident. Once you've restored the network to an acceptable state, it's time to transition to troubleshooting mode, which will lead you to the root cause of the incident. In the final chapter, I will discuss in detail the troubleshooting skill.



# TROUBLESHOOTING-NO MORE SHOOTING FROM THE HIP

UNDERSTAND THE  
WHAT, HOW, WHY,  
WHEN, AND WHERE.

### FIND THE ROOT CAUSE OF ANY ISSUE

Troubleshooting is all about building the bridge and taking the steps to your next career adventure because it requires you to essentially reverse engineer the incident in order to fully understand the what, how, why, when, and where. The opportunities for gaining experience in troubleshooting only come through encountering and overcoming failures and incidents. Therefore, a virtualization admin must embrace every incident and failure as an opportunity to grow and to show the world what you know. In addition, troubleshooting is not only about finding out what happened and devising a solution for how to prevent it from happening in the future. It's also about uncovering the *most optimal* solution amongst the N-solutions for any given problem or incident based on what's most important to you whether that is cost, performance, or any other design consideration. Preventing issues makes your life easier; creating an optimal solution is what makes your boss, and your boss' boss happy.

### SHOOT THE TROUBLE OUT OF YOUR IT STACK

As a virtualization admin, your focus should be on solving the right problem instead of chasing false positives. Time is money. Being able to quickly uncover the root of a virtual environment problem translates into being able to remediate it that much faster and having that remediation last longer. This will provide you with a lot of experience, but it can also keep you in the data centers after the close of business and during weekends and holidays.

“One way to shorten the standard troubleshooting procedural time is to leverage and excel in the skills of discovery, alerting, and remediation.”

## THE BASIC TROUBLESHOOTING FLOW TO USE IN ANY SITUATION INCLUDES THE FOLLOWING STEPS:

1. DEFINE THE PROBLEM.
2. GATHER AND ANALYZE RELEVANT INFORMATION.
3. CONSTRUCT A HYPOTHESIS ON THE PROBABLE CAUSE FOR THE FAILURE OR INCIDENT.
4. DEVISE A PLAN TO RESOLVE THE PROBLEM BASED ON HYPOTHESIS.
5. IMPLEMENT THE PLAN.
6. OBSERVE THE RESULTS OF THE IMPLEMENTATION.
7. REPEAT STEPS 2-6.
8. DOCUMENT THE SOLUTION.

The problem with these eight steps is that it assumes a virtualization admin has unlimited time and resources to root-cause every problem that arises. Unfortunately, time is a limited commodity for any IT pro. Fortunately, one way to shorten the standard troubleshooting procedural time is to leverage and excel in the skills of [discovery](#), [alerting](#), and [remediation](#). After all, they are the basis for troubleshooting. Steps 1, 2, and 3 in the troubleshooting work flow are covered by discovery and alerting. Steps 4-5 are remediation while steps 6-7 are exclusive to troubleshooting in action. Pairing these three skills with a [proper IT tool](#) can more quickly surface the single point of truth and provide the necessary insights to root-cause any issue in an efficient and effective manner across multiple stacks.

Follow these eight-steps and you can troubleshoot anything. And of course, it comes with a catch. As my first IT mentor always reminded me, the devil is in the details. Meaning that this framework provides consistency and rigor in your approach regardless of the issue at hand, but the questions that you ask, the performance data that you analyze, and the logged events that you focus on will vary depending on the type of issue that you encounter in your virtualization environment.

“One feature that VMware® vSphere™ admins use extensively to enable VM mobility is vMotion™. It allows admins to move a VM from one host server to another in the cluster.”

Essentially, your troubleshooting efforts will be customized for your multi-variable data center environment. So to simplify things, you should try and reduce your troubleshooting analysis to a binary decision – ask a question and the answer is either a '1'/Yes or a '0'/No.

## **BINARY DECISION APPLIED TO A SIMPLE VIRTUALIZATION TROUBLESHOOTING EXAMPLE**

One feature that virtualization admins use extensively is VM migration. It allows admins to move a VM from one host server to another in the cluster. It's quite useful for performing rolling maintenance on live servers in a cluster as well as re-distributing workloads across the virtual cluster.

For this example, we will use VMware's VM mobility feature, vMotion. vMotion was working for the eight VMs in Cluster A, a four-node cluster. After adding a fifth node to Cluster A, the virtualization admin discovered that vMotion failed to the newly added host. vCenter Server reports error messages that states that vMotion migration failed because the destination host did not receive data from the source host.

Use the eight-step process combined with the binary decision along the following facts: vMotion worked previously with the four existing host servers; but not the new node. All five host servers are identical in terms of hardware configuration and software version number and licensing.

**STEP 1: DEFINE THE PROBLEM - VMOTION IS NOT WORKING ON THE NEW HOST SERVER.**

**STEP 2: ONLY NOT WORKING ON THE NEWLY ADDED FIFTH HOST SERVER. USING ERROR MESSAGES FROM VCENTER LOGS TO GUIDE.**

**STEP 3: HYPOTHESIS - VMOTION WAS INCORRECTLY CONFIGURED ON THE NEW SERVER SINCE ALL THE OTHER FOUR ARE STILL WORKING.**

**STEPS 4 AND 5: APPLY BINARY DECISION TREE AND TEST HYPOTHESIS IN STEP 3.**

- 1. IS VMOTION ENABLED?**
  - YES, GO TO 2.**

“The troubleshooting skill is what virtualization admins can use across the career bridge.”

- NO, ENABLE IT AND GO TO 2.

## 2. VMKERNEL SETUP: IS A STANDARD VSWITCH USED?

- YES, GO TO 3.
- NO, GO TO 5.

## 3. IS VMKPING WORKING CORRECTLY VIA THE VMKERNEL NETWORK SELECTED FOR VMOTION?

- YES, GO TO STEP 6.
- NO, GO TO 4.

## 4. ARE THE NETWORK AND PORT GROUP LABELS THE SAME FOR HOST 5 AS THE OTHER SERVERS?

- YES, GO TO STEP 7.
- NO, FIX THE LABELS, GO TO STEP 6.

## STEP 6: DOES VMOTION WORK?

- YES, GO TO STEP 8.
- NO, GO TO STEP 7.

STEP 7: GO BACK TO STEP 2 AND DEVISE A NEW HYPOTHESIS FOR STEP 3. FOR INSTANCE, ANOTHER REASON THAT CAUSES VMOTION TO FAIL INCLUDE VMS WITH LOCALLY MOUNTED CDS/ISOS. REMEMBER TO DISCONNECT THEM PRIOR TO VMOTION.

STEP 8: DOCUMENT THE RESOLUTION.

AND THAT'S TROUBLESHOOTING IN A NUTSHELL.

## TROUBLESHOOTING: THE BRIDGE TO UTILITY

The troubleshooting skill is what virtualization admins can use across the career bridge. Trial by fire and overcoming IT incidents harden the IT pro with many qualities that are valued by organizations inside and outside of IT. These qualities include decision-making under duress, root-cause analysis, and a firm understanding the entirety of the stack. If you choose to leave IT, technical marketing, presales engineering, people management, and product management are real career possibilities for an analytical problem-solver. If you choose to advance up the IT ladder, you can find yourself immersed in engineering design, architecture, and strategy that encompass security, optimization, automation, and reporting. Master the four skills of discovery, alerting, remediation, and troubleshooting and you'll be ready to soar in virtualization!

# CONCLUSION

Thank you for reading. I hope that you enjoyed the ride and found value in this eBook. The skills of discovery, alerting, remediation, and troubleshooting can serve you well as you continue in your virtualization IT career. And stay tuned for a future book covering the skills of securing, optimizing, automating, and reporting your virtual environment. Lastly, I would like to leave you with a list of IT pros who maximize the DART skills.

## WHO'S WHO: VIRTUALIZATION DART SKILLS

The following list includes examples of experts who exhibit the best traits of the DART skills and willingly share their vast amount of IT knowledge.

1. [Duncan Epping](#) – [Yellow Bricks](#)
2. [Frank Denneman](#) – [Frank Denneman's blog](#)
3. [William Lam](#) – [virtually Ghetto](#)
4. [Brien M. Posey](#) – [Virtualizationadmin.com](#)
5. [Mike Preston](#) – [Mike Preston's blog](#)
6. [Todd Muirhead](#) – [Virtual Todd's Big Blog](#)
7. VMware Perf R&D team – [VROOM Blog](#)
8. [Leon Adato](#) – [Cost of Monitoring Series](#) and [Leon Adato's Blog](#)
9. [Aidan Finn](#) – [Aidan Finn's Microsoft Hyper-V Blog](#)
10. [Thomas LaRock](#) – [Thomas LaRock's Blog](#)



### ABOUT THE AUTHOR

Kong Yang is a Head Geek at SolarWinds with over 20 years of IT experience specializing in virtualization and Cloud management. He is a VMware® vExpert™, Cisco® Champion, and active contributing thought leader within the virtualization and Cloud communities.



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