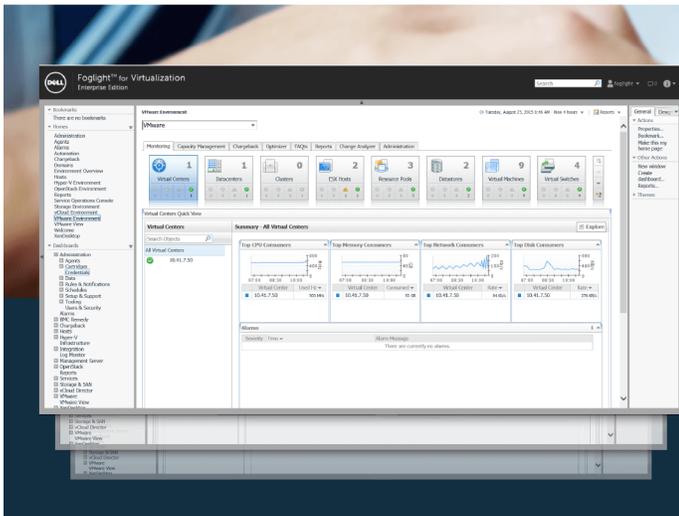


VIRTUALIZATION-MANAGEMENT COMPARISON: DELL FOGLIGHT FOR VIRTUALIZATION VS. SOLARWINDS VIRTUALIZATION MANAGER

More automation, fewer clicks, less time when managing your virtual environment with Dell™ Foglight™ for Virtualization Enterprise Edition



96X FASTER
to optimize storage

42X FASTER
to revert CPU and memory changes

MORE INFORMATION
to help identify network issues

in our tests compared to SolarWinds® Virtualization Manager online demo

Your company uses virtualization to maximize hardware efficiency in your large datacenters. While virtualizing can help save data center space and can be used to better balance your hardware resources to meet your needs, it can also require added planning, monitoring, and administrative management to make sure your environment is aptly provisioned and runs smoothly. By choosing an efficient virtualization management solution, your business can reduce the amount of time IT staff spends performing common management tasks.

In the Principled Technologies datacenter, we put the Dell Foglight for Virtualization Enterprise Edition management tool to the test, comparing it to the features of SolarWinds Virtualization Manager. We found that using the Dell Foglight solution to perform virtualization-management workflows was up to 96.3 times faster and required up to 97.7 percent fewer steps than the SolarWinds solution. We also found Dell Foglight for Virtualization to offer greater functionality in the areas of storage optimization, VM change tracking, and remediation. These advantages can reduce the amount of time IT staff spends managing your infrastructure and give them greater insights into your virtual infrastructure to maximize its efficiency.



MANAGING YOUR VIRTUALIZATION

Enterprise IT has fully embraced virtualization for its promise to boost efficiency, productivity, and flexibility while strengthening security and disaster recovery capabilities—all while reducing costs. However, proper virtualization management is essential to making the most of your infrastructure.

Selecting an effective and robust virtualization management tool can help you in a variety of management activities. To evaluate the Dell Foglight for Virtualization Enterprise Edition and SolarWinds Virtualization Manager solutions, we compared virtualization-monitoring workflows in the three areas:

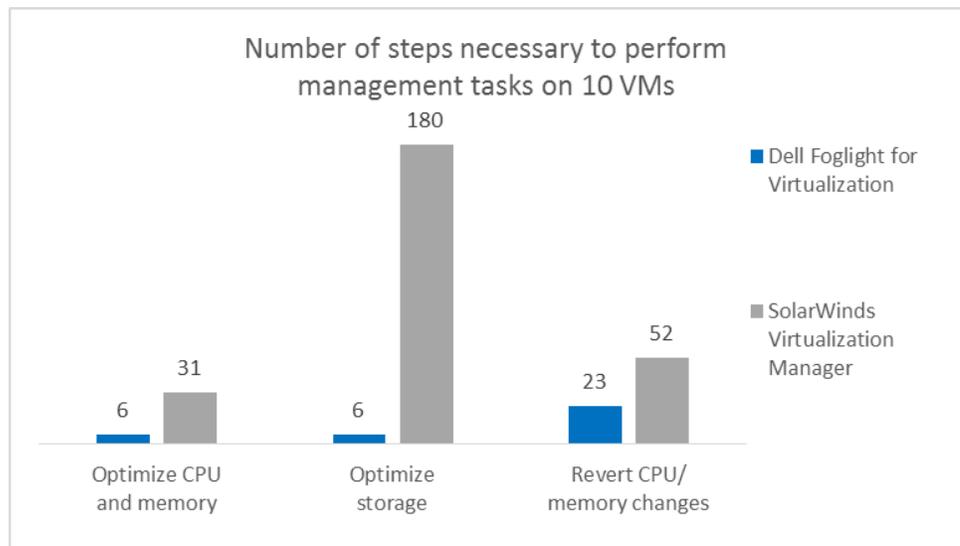
- **Virtual hardware optimization.** Having a management solution that can readily deliver recommendations to optimize your virtual hardware—CPU, memory, and storage—helps prevent resource waste from overprovisioning and can reallocate free resources toward virtual machines that are bottlenecked, promoting efficient hardware management without requiring time-consuming manual analysis. In our tests, we compared the time, steps, and available features for performing CPU, memory, and storage optimizations in 10 VMs.
- **VM change tracking.** The ability to track and manage changes in your virtualized infrastructure directly from your management software is extremely beneficial in large-scale enterprises with many virtual machines. It allows an IT administrator, or team of IT admins to quickly identify, evaluate, and roll common virtual hardware changes back quickly across one or multiple VMs should a problem arise. In our tests, we compared available features, and simulated the time and steps required to revert CPU and memory changes across a subset of 10 VMs.
- **Problem remediation.** Having access to detailed information within your virtualization management solution can help to easily identify a virtual hardware issue or bottleneck. In our tests, we compared the available information within each solution for identifying potential virtual network issues.

Note that we tested using a trial version of Dell Foglight for Virtualization, Enterprise Edition in a small, virtualized environment and, due to EULA restrictions, compared it to available SolarWinds Virtualization Manager documentation, and an online demonstration version of SolarWinds Virtualization Manager. To capture time and steps for performing manual tasks when those features were not fully available within SolarWinds Virtualization Manager, we performed these tasks using small virtualized environment identical to the one running Dell Foglight for Virtualization. While we base our feature comparisons on the features available within the demo as well as feature claims within documentation, the fully licensed version of SolarWinds Virtualization Manager may differ.

AN OVERVIEW OF OUR FINDINGS: LESS TIME, FEWER STEPS, GREATER FUNCTIONALITY

In the workflows we tested, the Dell Foglight solution provided a more efficient user experience for network and system managers and other support staff than did the simulations of SolarWinds Virtualization Manager. As Figure 1 shows, performing optimization tasks using Dell Foglight for Virtualization required 80 percent and 97 percent fewer steps for CPU/memory and storage optimizations, respectively, than performing the same tasks in a simulated environment with SolarWinds Virtualization Manager. Reverting CPU and memory changes required 56 percent fewer steps using the Foglight solution.

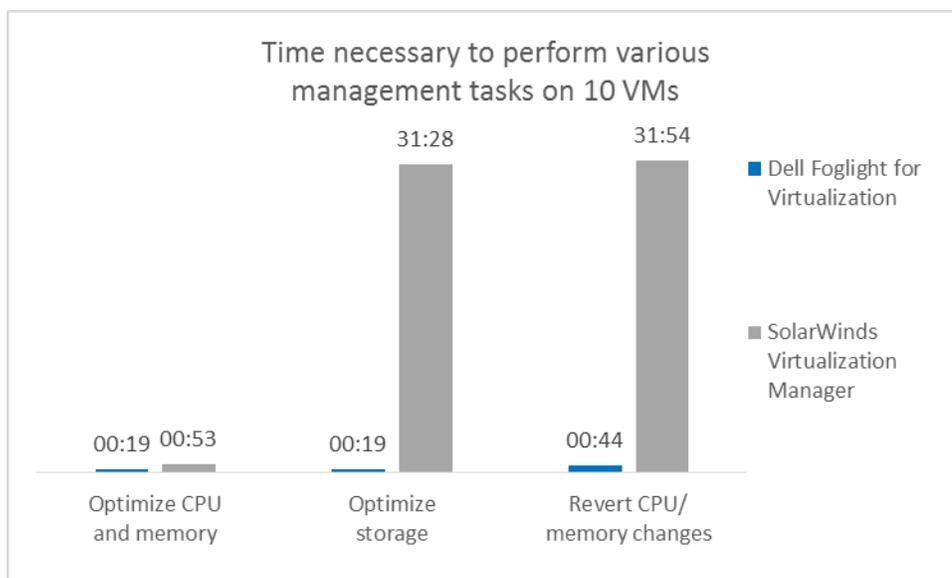
Figure 1: Executing management workflows on 10 VMs required many fewer steps using Dell Foglight for Virtualization than a simulated environment using SolarWinds Virtualization Manager. Smaller numbers are better.



When a solution requires fewer steps to perform a given task, not only are IT administrators likely to save time, but the potential for human error due to skipped steps or typos is also likely to decrease.

As Figure 2 shows, using Dell Foglight for Virtualization saved as much as 31 minutes, 2.7 times faster when optimizing CPU and memory, 96.3 times faster when optimizing storage, and 42.6 times faster when reverting changes over a simulated environment using SolarWinds Virtualization Manager.

Figure 2: Executing optimization and change reversion workflows on 10 VMs required much less time using Dell Foglight for Virtualization than using SolarWinds Virtualization Manager. Smaller numbers are better.



Note that this representative test involved changes on only 10 VMs. Given the efficiency of Dell Foglight for Virtualization when implementing VM changes on multiple VMs, these time savings could be even greater in a large enterprise where optimizations and changes are performed on a significantly larger number of VMs at a time.

As Figure 3 shows, in addition to saving time and steps, Dell Foglight for Virtualization offers added functionality that was not present in the version of SolarWinds Virtualization Manager that we tested.

Dell Foglight for Virtualization	SolarWinds Virtualization Manager
Optimization workflow	
Optimized CPU, memory, and storage.	Could optimize only CPU and memory. Storage optimizations had to be performed manually.
Optimized multiple VMs at once.	Could optimize only one VM at a time.
Optimization tasks could be scheduled and automated.	Did not support scheduled optimizations.
VM change tracking workflow	
Tracked VM changes and VM performance, allowing admins to identify the impact (if any) of CPU/memory modifications.	Could not track VM changes.
Allowed reverting CPU/memory modifications to earlier states.	Required using hypervisor logs to manually identify and then revert individual VM changes.
Problem remediation workflow – virtual networking	
Provided detailed information on VMware virtual switches, virtual adapters, and provided detailed metrics.	Provided only hypervisor-level information.

Figure 3: Across a range of virtualization-management areas, Dell Foglight for Virtualization offered more robust functionality than SolarWinds Virtualization Manager did.

DIGGING DEEPER: OUR RESULTS IN DETAIL

Optimization

To get the most from your virtual machines and efficiently manage hardware resources, an IT admin team must perform regular virtual resource optimizations as usage patterns emerge and change within your environment. In our testing, we compared the two solutions' abilities for VM optimizations across a subset of 10 VMs, and identified two aspects of optimization where Dell Foglight for Virtualization was superior to SolarWinds Virtualization Manager:

- Dell Foglight can optimize CPU, memory, and storage, whereas SolarWinds Virtualization Manager can optimize only CPU and memory. This means that optimizing storage in the SolarWinds environment is a manual process.
- Dell Foglight offers immediate, scheduled, and automated optimization options, whereas SolarWinds Virtualization Manager doesn't support scheduled optimization. Being able to schedule optimization for the middle of the night when usage is low is a convenient feature for IT admins, reducing the number of required maintenance events they must perform during off-hours.

Figure 4 presents a screenshot of the Dell Foglight for Virtualization Optimizer. As it shows, this tool uses a graphical user interface that allows admins to perform complex optimization tasks by clicking on the various resources.

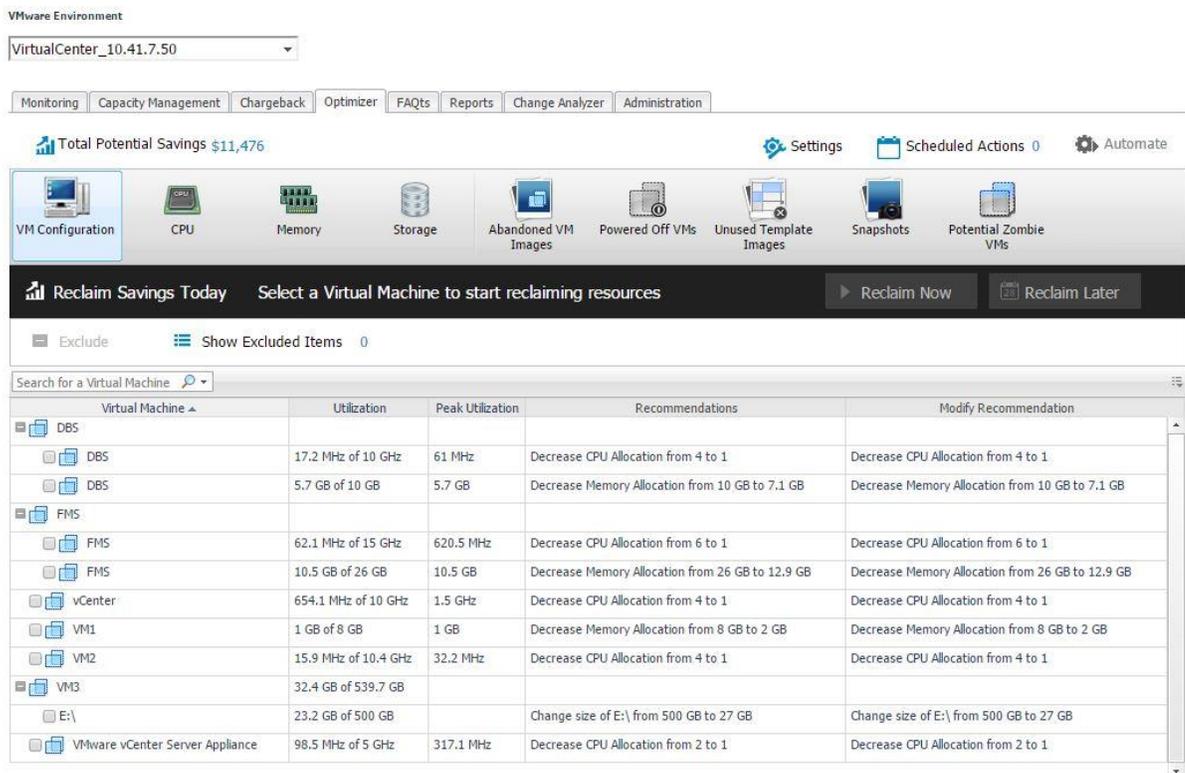


Figure 4: Dell Foglight for Virtualization Optimizer.

Optimizing CPU and memory

As Figure 5 shows, because Dell Foglight for Virtualization allows you to optimize multiple VMs simultaneously, using this tool to perform our optimization task on 10 VMs took no more steps than it did for a single VM. In contrast, because SolarWinds Virtualization Manager lets you optimize only one VM at a time, we needed 31 steps to optimize 10 VMs with this tool. That means that Foglight required 80.6 percent fewer steps when modifying 10VMs.

Figure 5: Number of steps needed to optimize CPU and memory on and 10 VMs. Smaller numbers are better.

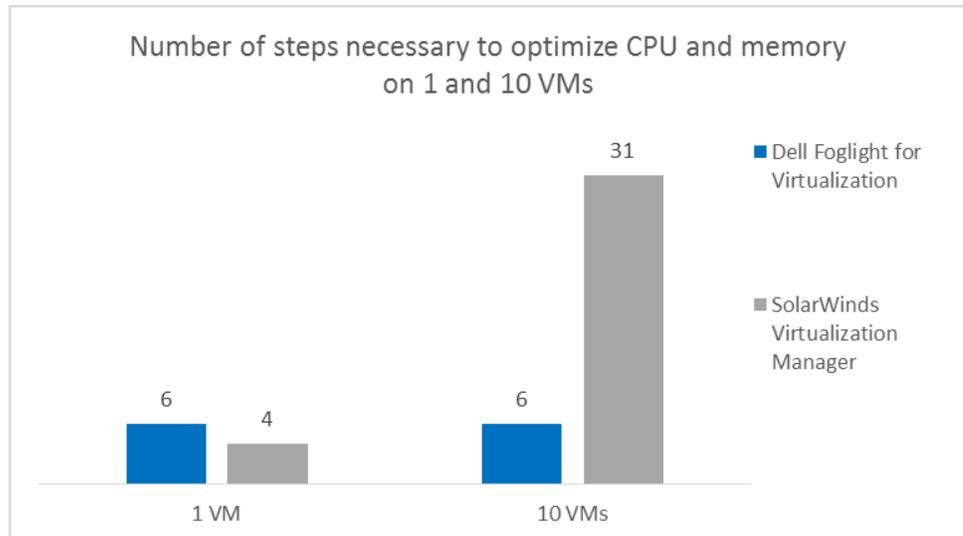
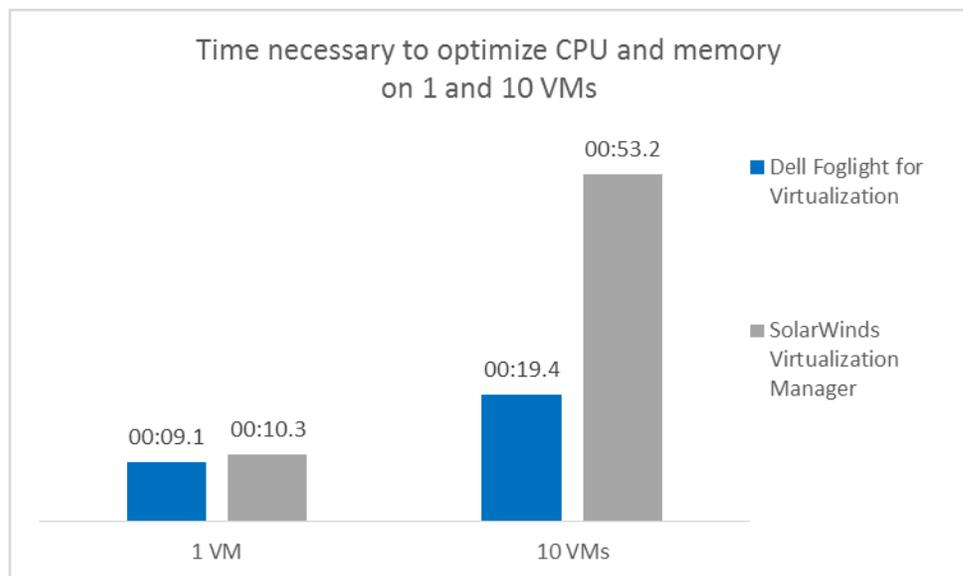


Figure 6 shows the time that these optimization tasks took using the two solutions. As it shows, Dell Foglight for Virtualization completed CPU and memory optimizations on 10 VMs in less than 20 seconds of admin time, 63 percent less time than SolarWinds Virtualization Manager needed to accomplish the same task.

Figure 6: Time (in seconds) needed to optimize CPU and memory on 1 and 10 VMs. Smaller numbers are better.



Because IT admins are likely to implement changes on multiple VMs at a time, Dell Foglight for Virtualization Enterprise Edition offers a dramatic advantage by allowing them optimize multiple VMs by making only a few additional selections within a single screen. Dell Foglight for Virtualization Enterprise Edition also allows admins the convenience of scheduling these optimizations to take place during off-peak hours, whereas IT admins using SolarWinds would need to be present at those times to perform the optimizations.

Optimizing storage

As we mentioned earlier, Dell Foglight for Virtualization Enterprise Edition supports virtualization of storage whereas SolarWinds Virtualization Manager does not. As Figure 7 shows, because Dell Foglight for Virtualization allows you to optimize multiple VMs simultaneously, using this tool to perform our storage-optimization task on 10 VMs took no more steps than it did for a single VM. In contrast, SolarWinds Virtualization Manager requires admins to use a manual process for optimizing storage. This required 18 steps for a single VM. With no economy of scale, optimizing storage for 10 VMs took 180 steps. That means that SolarWinds Virtualization Manager required 30 times the number of steps that Dell Foglight for Virtualization required.

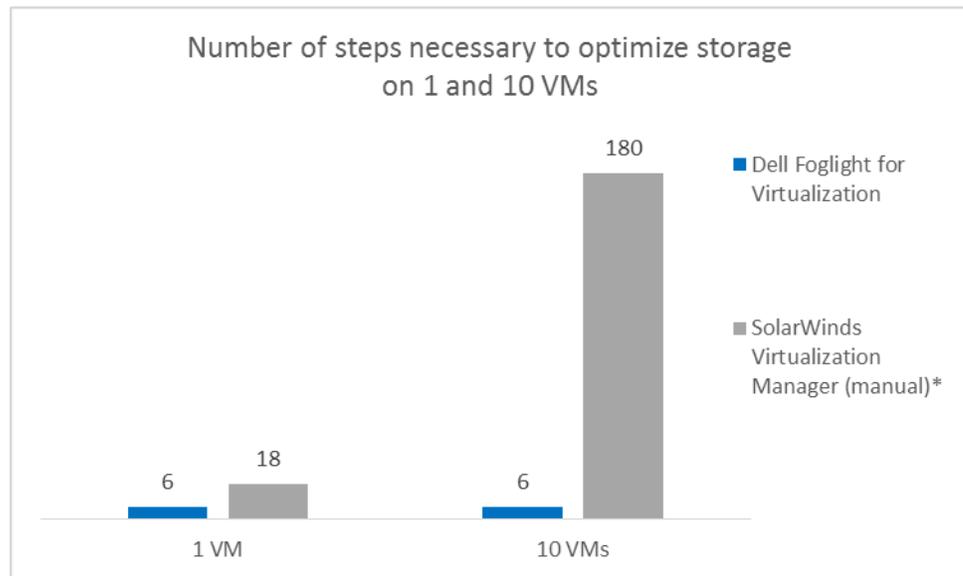
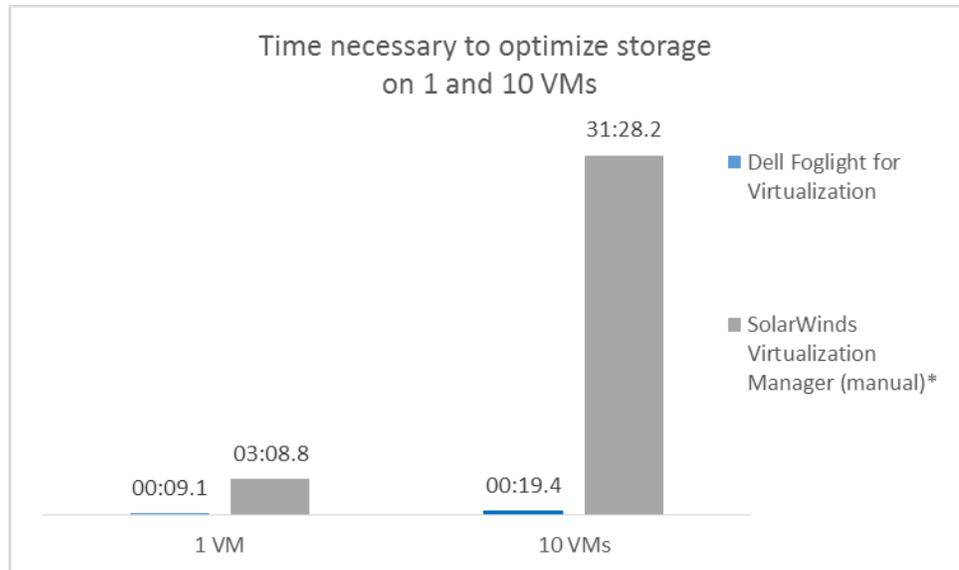


Figure 7: Number of steps needed to optimize storage on and 10 VMs. Smaller numbers are better.

Unsurprisingly, performing 180 steps took a great deal longer than performing six steps. As Figure 8 shows, Dell Foglight for Virtualization completed storage optimizations on 10 VMs in less than 20 seconds of admin time, while admins using SolarWinds Virtualization Manager would need to spend more than half an hour to complete the same task.

Figure 8: Time (in minutes:seconds) needed to optimize storage on 1 and 10 VMs. Smaller numbers are better.



VM change tracking

Having a thorough history of changes helps IT administrators in a number of ways: it helps diagnose problems and unanticipated performance degradation, it lets them revert to an earlier state if problems arise, and it helps with reporting to change advisory boards. Dell Foglight for Virtualization records VM performance over time, assigning an overall health rating between 0 and 100 points to each VM that aggregates virtual hardware resource metrics. Dell Foglight for Virtualization also tracks VM changes and automatically correlates the VM performance rating with VM changes to provide a performance metric that helps to identify easily any performance degradation or issues resulting from specific VM changes. Additionally, Dell Foglight for Virtualization gives you the option of reverting these VM changes to an earlier state. In contrast, SolarWinds Virtualization Manager does not track environment changes.

Figure 9 presents a screenshot that shows how Dell Foglight for Virtualization lets you revert changes by clicking, a very quick process.

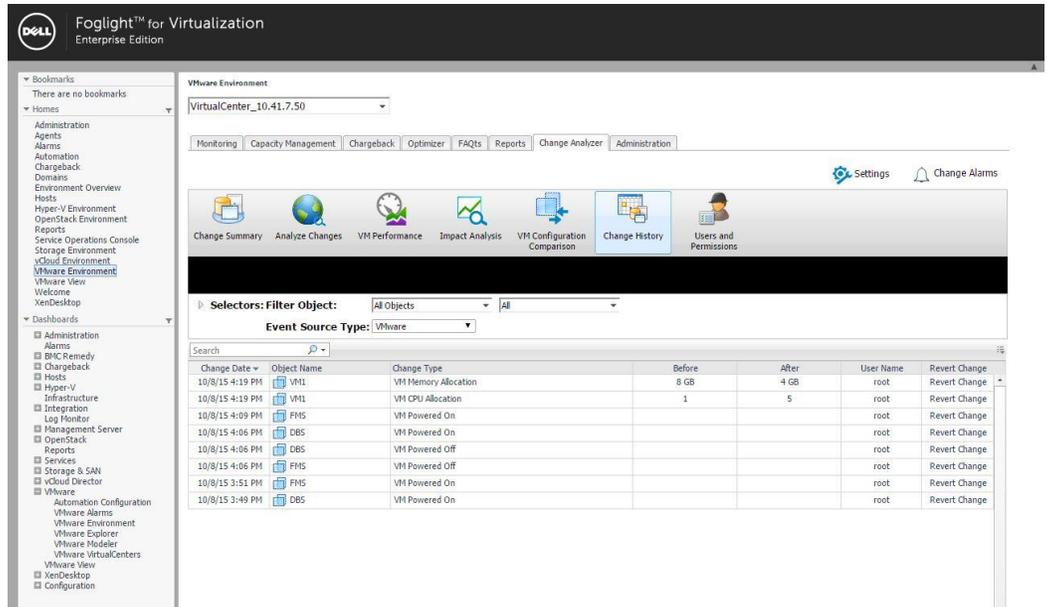


Figure 9: Change reversion in Dell Foglight for Virtualization.

SolarWinds does not offer a specific revert changes feature. An IT admin must log into vCenter to review logs and identify the changes made before modifying CPU/memory through SolarWinds, a time-consuming process.

As Figure 10 shows, using Dell Foglight for Virtualization required two fewer steps than SolarWinds Virtualization Manager required to revert CPU and memory changes on a single VM. This advantage scaled to 29 fewer steps to perform the task on 10 VMs.

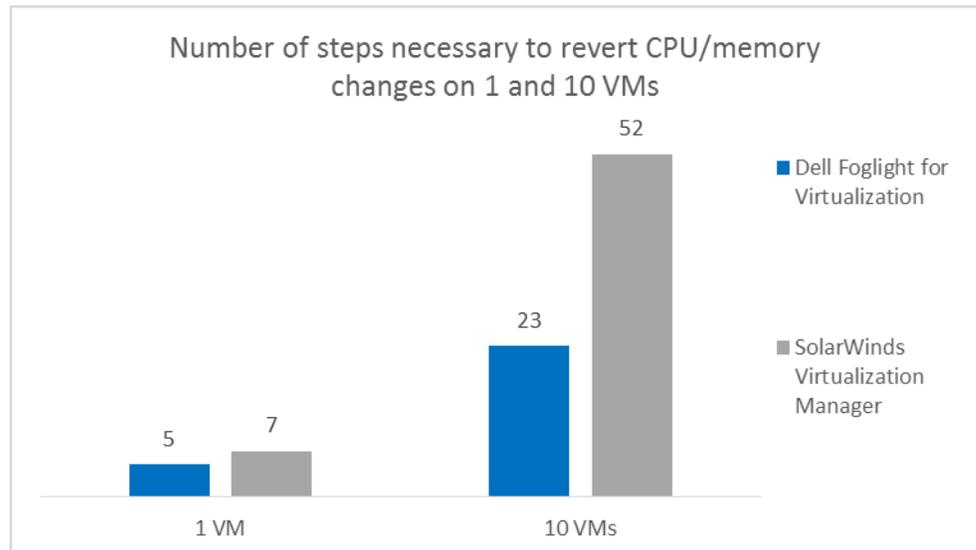
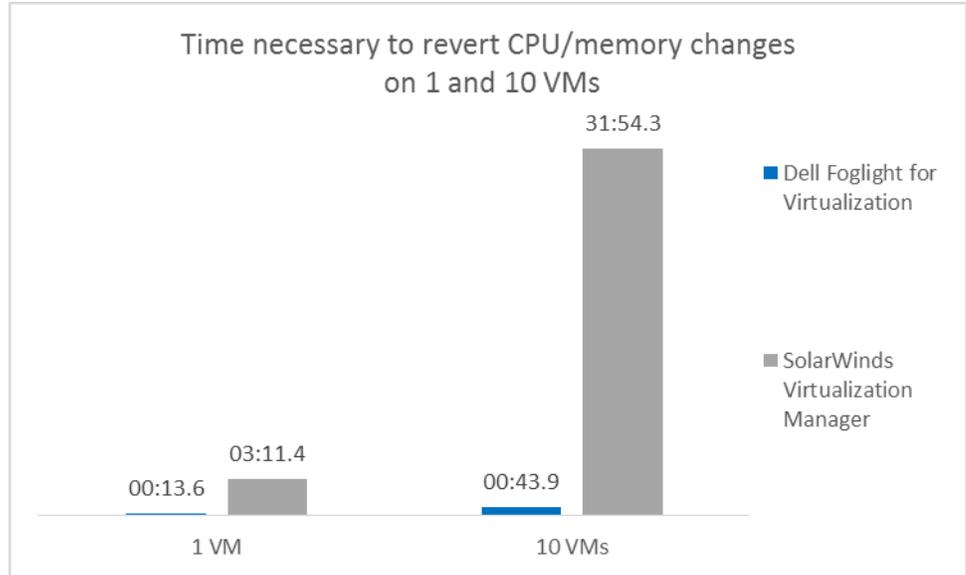


Figure 10: Number of steps needed to revert CPU/memory changes on and 10 VMs. Smaller numbers are better.

As Figure 11 shows, reverting changes on 10 VMs took less than a minute using Dell Foglight for Virtualization and more than half an hour using SolarWinds Virtualization Manager. In fact, the SolarWinds solution took 42 times longer than the Foglight solution.

Figure 11: Time (in minutes:seconds) needed to revert CPU/memory changes on 1 and 10 VMs. Smaller numbers are better.



Problem remediation

When IT administrators face performance degradation in their environment, having more information available from their management tool can help resolve these issues more efficiently. In our tests, we compared the virtual network information available in both solutions using a hypothetical scenario where an IT admin must identify a network bottleneck. We found that compared to SolarWinds Virtualization Manager, Dell Foglight for Virtualization provided a more detailed information its dashboard.

Figure 12 presents four categories of network information. Dell Foglight for Virtualization provides all of these, while SolarWinds Virtualization Manager provides only hypervisor-level network traffic information. This means that admins monitoring virtual networks have much less built-in information to work with, which could make the identification and remediation of potential network bottlenecks more difficult to perform.

	Dell Foglight for Virtualization	SolarWinds Virtualization Manager
Hypervisor-level network traffic information	Yes	Yes
Standard & distributed VMware virtual switch information	Yes	No
Mapping for VM, virtual switch and virtual adapter connection topologies	Yes	No
Detailed metrics display for virtual networking components	Yes	No

Figure 12: Network information that the two solutions provide.

Dell Foglight for Virtualization monitors both standard and distributed VMware virtual switches and maps VM, virtual switch, and virtual adapter connection topologies. It also displays detailed metrics to identify networking issues quickly. In contrast, SolarWinds Virtualization Manager can't monitor VMware virtual switches. It also requires vCenter console to investigate networking issues. Figure 13 illustrates how Dell Foglight for Virtualization presents a visual display of your network topology.

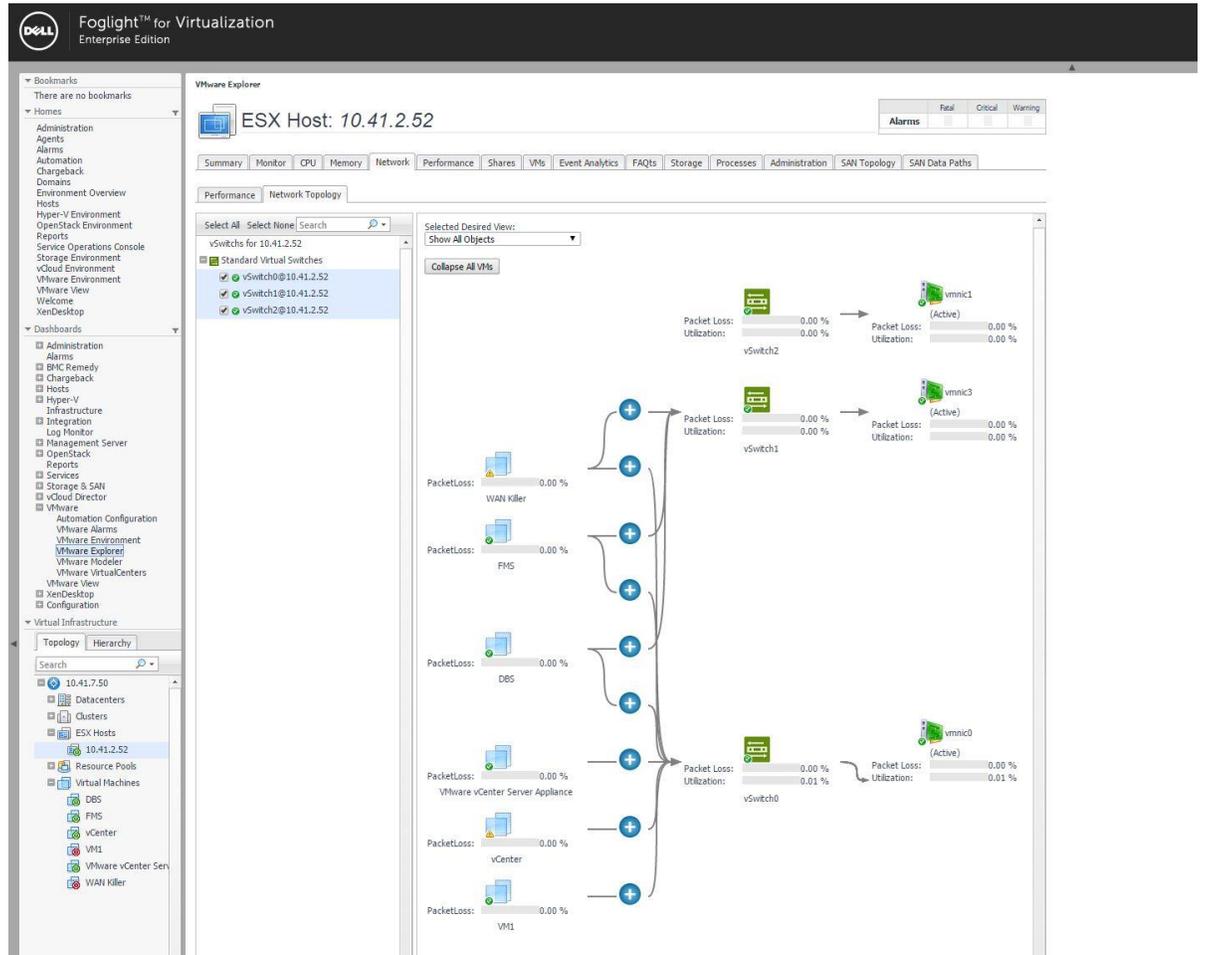


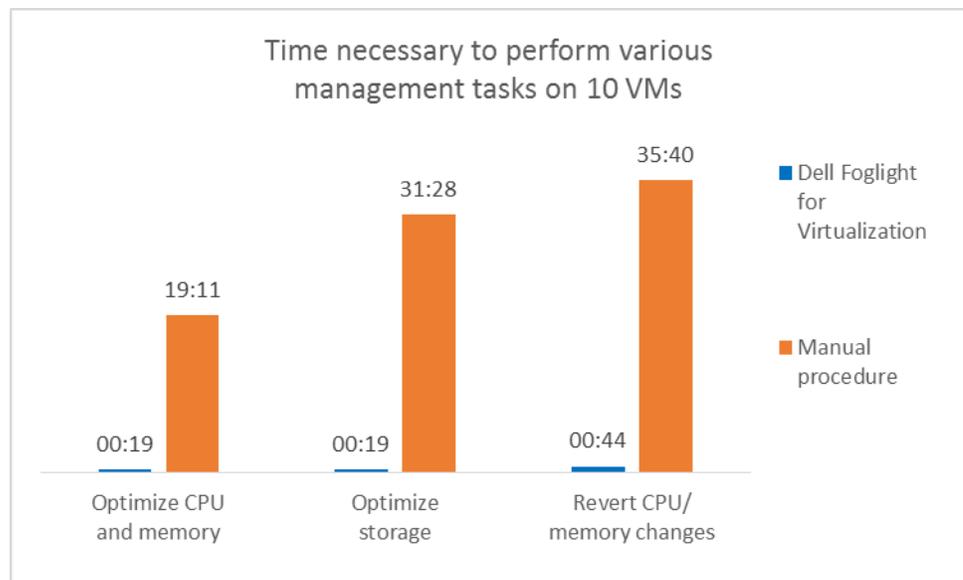
Figure 13: Dell Foglight for Virtualization let you see at a glance where the problems in your network are located.

WHAT ABOUT USING NO VIRTUALIZATION MANAGEMENT TOOL?

In this report, we have compared the experience of performing virtualization management tasks using two tools designed to make this process easier. In this section, we briefly compare the experience of using Dell Foglight for Virtualization with using no management tool at all and performing all tasks manually. (We present complete details of our manual testing in [Appendix B](#) and [Appendix C](#).)

As Figure 14 shows, the time needed to complete these three management tasks on 10 VMs using Dell Foglight for Virtualization was a small fraction of that required to perform the jobs completely manually—less than 2 minutes vs. almost an hour and a half. In large enterprise datacenters, IT administrators can be responsible for hundreds or thousands of VMs. It is easy to see how managing these VMs using a manual approach can be cost-prohibitive to perform, either requiring a significant amount of time to maintain operating efficiency or falling prey to overprovisioned resources and under-utilized hardware. Taking advantage of a virtualization management solution such as Dell Foglight for Virtualization could be extremely advantageous to an IT admin team by helping to maintain efficiency in your virtual environment while allowing the team to dedicate necessary time toward capacity planning, future proofing, and hardware maintenance to keep your data center running at its best.

Figure 14: Executing optimization and change reversion workflows on 10 VMs required very little time compared to doing so using a manual procedures. (Smaller numbers are better.)



CONCLUSION

As your infrastructure scales up to dozens, hundreds, or thousands of monitored VMs, the time and complexity of performing tasks such as the ones we used for our testing workflows increases dramatically. The time savings that are possible when using Dell Foglight for Virtualization have the potential to remove an enormous management burden from your IT staff.

Thanks to its easy-to-use, powerful user interface and greater functionality, the Dell Foglight for Virtualization solution gives your staff the opportunity to identify and respond more quickly to problems, preventing and resolving issues with the potential to minimize downtime or poor performance for your customers and employees.

In the Principled Technologies datacenter, we tested the Dell Foglight for Virtualization Enterprise Edition management tool and compared it to the features that SolarWinds Virtualization Manager publicizes.

Using the Dell Foglight solution to perform virtualization-management workflows was up to 96.3 times faster and required up to 97.7 percent fewer steps than the SolarWinds solution. Dell Foglight for Virtualization also offers greater functionality in optimization, environmental change tracking, and problem remediation.

When IT staff can spend less time on routine management tasks, they have a greater opportunity to innovate and your business benefits.

APPENDIX A – SERVER CONFIGURATION INFORMATION

Software

PT installed and deployed Dell Foglight for Virtualization on a server with the following software configuration:

- OS: VMware vSphere 5.5
- Software: Foglight for Virtualization Enterprise Edition 8.2 trial – Virtual Appliance

PT used the SolarWinds Virtualization Manager online demo site for evaluation.

Hardware

Figure 15 provides detailed configuration information for the management and host systems.

Server	Management	Host
Platform		
Vendor and model number	Dell PowerEdge R720	Dell PowerEdge R720
Motherboard model number	0X3D66A00	0X3D66A00
BIOS name and version	Dell 2.5.2 (01/28/2015)	Dell 2.5.2 (01/28/2015)
BIOS settings	Default	Default
General dimension information		
Height (inches)	3.2	3.2
Width (inches)	17.5	17.5
Depth (inches)	27.5	27.5
Power supplies		
Total number	1	2
Wattage of each (W)	750	750
Cooling fans		
Total number	6	6
Dimensions (h x w) of each	2.5 x 2.5 in ²	2.5 x 2.5 in ²
Voltage (V)	12	12
Amps (A)	1.5	1.5
General processor setup		
Number of processor packages	2	2
Number of cores per processor package	10	8
Number of hardware threads per core	20	16
System power management policy	Default	Default
CPU		
Vendor	Intel®	Intel
Name	Xeon® E5-2670 v2	Xeon E5-2650 v2
Stepping	4	4
Socket type	FCLGA2011	FCLGA2011
Core frequency (GHz)	2.5	2.6
L1 cache	32KB +32KB (per core)	32KB +32KB (per core)
L2 cache	256KB (per core)	256KB (per core)

Server	Management	Host
L3 cache	25MB	20MB
Memory modules		
Total RAM in system (GB)	64	64
Vendor and model number	Samsung® M393B1K70BH1-CH9	SK Hynix® HMT31GR7BFR4A-H9
Type	PC3-10600	PC3-10600
Speed (MHz)	1333	1333
Speed in the system currently running @ (MHz)	1333	1333
Timing/latency (tCL-tRCD-iRP-tRASmin)	9-9-9-36	9-9-9-36
Size (GB)	8	8
Number of RAM modules	8	8
Chip organization	Dual	Dual
Hard disks		
Vendor and Model Number	Western Digital® WD3000BKHG-18A29V0	Seagate® ST9300605SS
Number of disks in the system	6	6
Size (GB)	300	300
Buffer size (MB)	32	64
RPM	10K	10K
Type	SAS HDD	SAS HDD
Operating system		
Name	VMware ESXi 5.5.0	VMware ESXi 5.5.0
Build number	2718055	2718055
File system	VMFS	VMFS
Language	English	English
Network adapter 1		
Type	Integrated	Integrated
Vendor and model number	Intel Gigabit 4P I350-t rNDC	Intel Gigabit 4P I350-t rNDC
Storage controller 1		
Vendor and model number	Dell PERC H710P Mini	Dell PERC H310 Mini
Cache size	1024MB	0MB
Driver	06.803.52.00	06.803.52.00
Firmware	21.3.1-0004	20.13.1-0002

Figure 15: System configuration information for the servers.

Figure 16 shows the hardware environment used to test and deploy our Dell Foglight for Virtualization environment, as well as test the tasks that required manual steps.

Server model	Processors	Memory (GB)	Storage	Functional role
1 x Dell PowerEdge R720	Intel Xeon processor E5-2600 product family	64 GB (16 x 8GB) PC3L-10600R	6 x 300GB 10K SAS HDDs (2 x RAID 1 OS + 4 x RAID 5 VM data)	Dell Foglight for Virtualization management server
1 x Dell PowerEdge R720	Intel Xeon processor E5-2600 product family	64 GB (16 x 8GB) PC3L-10600R	6 x 300GB 10K SAS HDDs (2 x RAID 1 OS + 4 x RAID 5 VM data)	Virtual machine host

Figure 16: Dell Foglight for Virtualization hardware environment.

APPENDIX B – STEPS TO COMPLETE OUR SCENARIOS

Optimizing CPU and memory on a single VM

Dell Foglight for Virtualization	SolarWinds Virtualization Manager	Manual procedure
<ol style="list-style-type: none"> 1. Under Homes, select VMware Environment. 2. Select the Optimizer tab. 3. Select VM Configuration. 4. Check every box for the VM that needs optimization. 5. Click Reclaim Now. 6. Click Confirm. <p style="text-align: center;">Total number of steps: 6</p>	<ol style="list-style-type: none"> 1. From the Home page, hover over Virtualization, and click Sprawl. 2. Next to the desired VM, click Change CPU/Memory Resources. 3. Review the recommended changes. 4. Click Save. <p style="text-align: center;">Total number of steps: 4</p>	<ol style="list-style-type: none"> 1. Log into vCenter. 2. Click VMs and Templates. 3. Select the VM to optimize. 4. Click the Monitor tab. 5. Click Performance. 6. Review the CPU, Memory, Network, and Disk performance. Identify performance issues and assess possible changes to improve performance. For this exercise, CPU and memory are selected for the change. 7. Right-click the VM, and select Shutdown Guest OS. 8. Click Yes at the prompt. 9. Once the VM is shutdown, right-click the VM, and click Edit Settings. 10. Change the CPU count to the desired number. Enter the new amount for the memory. Click OK. 11. Right-click the VM and click Power On. <p style="text-align: center;">Total number of steps: 11</p>

Optimizing CPU and memory on 10 VMs

Dell Foglight for Virtualization	SolarWinds Virtualization Manager	Manual procedure
<ol style="list-style-type: none"> 1. Under Homes, select VMware Environment. 2. Select the Optimizer tab. 3. Select VM Configuration. 4. Check every box for all the VM that need optimization. 5. Click Reclaim Now. 6. Click Confirm. <p>Total number of steps: 6</p>	<ol style="list-style-type: none"> 1. From the Home page, hover over Virtualization, and click Sprawl. 2. Next to the first VM, click Change CPU/Memory Resources. 3. Review the recommended changes. 4. Click Save. 5. Click Change CPU/Memory Resources next to the second VM. 6. Review the recommended changes. 7. Click Save. 8. Click Change CPU/Memory Resources next to the third VM. 9. Review the recommended changes. 10. Click Save. 11. Click Change CPU/Memory Resources next to the fourth VM. 12. Review the recommended changes. 13. Click Save. 14. Click Change CPU/Memory Resources next to the fifth VM. 15. Review the recommended changes. 16. Click Save. 17. Click Change CPU/Memory Resources next to the sixth VM. 18. Review the recommended changes. 19. Click Save. 20. Click Change CPU/Memory Resources next to the seventh VM. 21. Review the recommended changes. 	<ol style="list-style-type: none"> 1. Log into vCenter. 2. Click VMs and Templates. 3. Select the VM to optimize. 4. Click the Monitor tab. 5. Click Performance. 6. Review the CPU, Memory, Network, and Disk performance. Identify performance issues and assess possible changes to improve performance. For this exercise, CPU and memory are selected for the change. 7. Right-click the VM, and select Shutdown Guest OS. 8. Click Yes at the prompt. 9. Once the VM is shutdown, right-click the VM, and click Edit Settings. 10. Change the CPU count to the desired number. Enter the new amount for the memory. Click OK. 11. Right-click the VM and click Power On. <p>Repeat steps 3 through 11 for remaining nine VMs. To save space, we do not repeat these steps here.</p> <p>Total number of steps: 92</p>

Dell Foglight for Virtualization	SolarWinds Virtualization Manager	Manual procedure
	22. Click Save. 23. Click Change CPU/Memory Resources next to the eighth VM. 24. Review the recommended changes. 25. Click Save. 26. Click Change CPU/Memory Resources next to the ninth VM. 27. Review the recommended changes. 28. Click Save. 29. Click Change CPU/Memory Resources next to the tenth VM. 30. Review the recommended changes. 31. Click Save. Total number of steps: 31	

Optimizing storage on one VM

Dell Foglight for Virtualization	SolarWinds Virtualization Manager	Manual procedure
1. Under Homes, select VMware Environment. 2. Select the Optimizer tab. 3. Select VM Configuration. 4. Check every box for all the VM that need optimization. 5. Click Reclaim Now. 6. Click Confirm. Total number of steps: 6	Does not support, must use manual procedure	1. Log into vCenter. 2. Click VMs and Templates. 3. Right-click the VM, and select Shutdown Guest OS. 4. Click Yes at the prompt. 5. Once the VM is shutdown, open VMware vCenter Converter. 6. Click Convert Machine. 7. On the Source System screen, select VMware Infrastructure virtual machine, enter the IP address for the ESXi host, and enter the credentials for the host. Click Next. 8. Select the source VM that needs the VMDK resized and click Next. 9. On the Destination System screen, select the destination type, enter the IP and credentials

Dell Foglight for Virtualization	SolarWinds Virtualization Manager	Manual procedure
		<p>for the destination vCenter, and click next.</p> <ol style="list-style-type: none"> 10. Enter a name for the new VM, and click Next. 11. Select the destination location for the VM, and click Next. 12. On the Options screen, click Edit under Data to copy. 13. For data copy type, choose Select volumes to copy. Select the minimum amount for the C: volume. 14. Select Advanced options, and check Power on destination VM and check Customize guest preferences for the virtual machine. Click Next. 15. Provide the information for Computer name and IP address. Click Next. 16. On the Summary screen, click Finish. 17. Once the new VM has been created, right-click the old VM in vCenter and Select All vCenter Action→Delete from disk. 18. Click OK. <p>Total number of steps: 18</p>

Optimizing storage on 10 VMs

Dell Foglight for Virtualization	SolarWinds Virtualization Manager	Manual procedure
<p>Requires the same six steps as optimizing storage on one VM.</p> <p>Total number of steps: 6</p>	<p>Does not support, must use manual procedure</p> <p>Total number of steps: 180</p>	<p>Requires the same 18 steps as optimizing storage on one VM and repeating nine times for remaining VMs.</p> <p>Total number of steps: 180</p>

Reverting CPU/memory changes on one VM

Dell Foglight for Virtualization	SolarWinds Virtualization Manager	Manual procedure
<ol style="list-style-type: none"> 1. Under Homes, select VMware Environment. 2. Select the Change Analyzer tab. 3. Inspect the Change history log and locate event you want to revert 4. Click Revert Change. 5. Select to implement now or later and click Save. <p>Total number of steps: 5</p>	<ol style="list-style-type: none"> 1. SSH into the VM host server. 2. Navigate to the VM log file location. 3. Manually inspect change history logs to find VM event you want to revert. 4. In the SolarWinds Virtualization Manager Home page, hover over Virtualization, and click Sprawl. 5. Next to the desired VM, click Change CPU/Memory Resources. 6. Review the recommended changes. 7. Click Save. <p>Total number of steps: 7</p>	<ol style="list-style-type: none"> 1. SSH into the VM host server. 2. Navigate to the VM log file location. 3. Manually inspect change history logs to find VM event you want to revert. 4. Log into vCenter 5. In vCenter, click VMs and Templates. 6. Right-click the desired VM, and click Shutdown Guest OS. 7. Click Yes at the prompt. 8. Once the VM is shutdown, right-click the VM, and click Edit Settings. 9. Change the CPU count to the desired number. Enter a new amount for the memory. Click OK. 10. Right-click the VM and click Power On. <p>Total number of steps: 10</p>

Reverting CPU/memory changes on 10 VMs

Dell Foglight for Virtualization	SolarWinds Virtualization Manager	Manual procedure
<ol style="list-style-type: none"> 1. Under Homes, select VMware Environment. 2. Select the Change Analyzer tab. 3. View the Change history log and locate event(s) you want to revert 4. Click Revert Change. 5. Select to implement now or later and click Save. Repeat steps 4 through 5 for remaining nine VMs. <p>Total number of steps: 23</p>	<ol style="list-style-type: none"> 1. SSH into the VM host server. 2. Navigate to the VM log file location. 3. Manually inspect change history logs to find VM event you want to revert. Repeat steps 2 and 3 nine more times to document changes in need of reversion for additional VMs. (21 steps for this section) 4. In the SolarWinds Virtualization Manager Home page, hover over Virtualization, and click Sprawl. 5. Next to the desired VM, click Change CPU/Memory Resources. 6. Review the recommended changes. 7. Click Save. Repeat steps 5 through 7 for remaining nine VMs. (31 steps for this section) <p>Total number of steps: 52</p>	<ol style="list-style-type: none"> 1. SSH into the VM host server. 2. Navigate to the VM log file location. 3. Manually inspect change history logs to find VM event you want to revert. Repeat steps 2 and 3 nine more times to document changes in need of reversion for additional VMs. (21 steps for this section) 4. In vCenter, click VMs and Templates. 5. Right-click the desired VM, and click Shutdown Guest OS. 6. Click Yes at the prompt. 7. Once the VM is shutdown, right-click the VM, and click Edit Settings. 8. Change the CPU count to the desired number. Enter a new amount for the memory. Click OK. 9. Right-click the VM and click Power On. Repeat steps 5 through 9 for remaining nine VMs. (51 steps for this section). <p>Total number of steps: 72</p>

APPENDIX C – TEST RESULTS

Figure 16 shows the time and steps required for our test scenarios using the two management solutions and a manual procedure.

		Dell Foglight for Virtualization	SolarWinds Virtualization Manager	Manual procedure
Optimizing CPU and memory				
1 VM	Time (min:sec)	00:09.1	00:10.3	02:08.6
	Steps	6	4	11
10 VMs	Time (min:sec)	00:19.4	00:53.2	19:10.5
	Steps	6	31	92
Optimizing storage				
1 VM	Time (min:sec)	00:09.1	03:08.8	03:08.8
	Steps	6	18	18
10 VMs	Time (min:sec)	00:19.4	31:28.2	31:28.2
	Steps	6	180	180
Reverting CPU/memory changes				
1 VM	Time (min:sec)	00:13.6	03:11.4	03:34.0
	Steps	5	7	10
10 VMs	Time (min:sec)	00:43.9	31:54.3	35:39.9
	Steps	32	52	72

Figure 16: The complete results of our testing.

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