HPE Server Automation 10.50

Windows Patch Management
Performance Characterization

White Paper

Contents

Summary of performance results

HPE tested the Windows Patch Management functionality of Server Automation version 10.50 in the HPE Performance lab. The aim was to validate the overall throughput and resource demand for a well-defined workload.

The table below summarizes the optimal throughput (@1000 concurrent managed servers) of Windows Server 2012 R2 patching results for the following patch set:

Windows Server 2012 R2 patch set	Patch details	Average Throughput @1000 managed servers (Managed servers per minute)	Number of SA Core slices
15-patch set	15 patches installed	7.5	one slice
	66.8 MB payload transferred	10.35	two slices

Test case description

The implemented Windows patch management test case consists of the following setup:

- Test environment configured using vCenter 5.5 running on Hewlett-Packard Gen 8 and Gen 9 Blade servers and 10 GBPS TCP networks
- Virtualized SA Core servers and Windows Server 2012 R2/64-bit managed servers that run on the ESXi hosts
- Concurrently patches up to 1000 managed Windows 2012 R2 servers.
- Each managed server is an unpatched Windows Server 2012 R2 64-bit virtual machine (VM) running on VMware ESXi 5.1 host.
- The managed server VMs are evenly distributed across 28 ESXi hosts, giving a maximum of 35 VMs per ESXi host.
- The patch management test case run on two SA Core configurations, once on a single slice and the second time on a two-slice Core. This highlights the workload distribution among the SA slices.
- A managed server device group with single patch policy attached. The policy consists of a 15-patch set, 15 patches installed and a 66.8 MB payload transferred.
- The patching job is submitted via the SA Twist UAPI through pytwist. The test environment is driven through the SA AXIS Test Manager.

Performance results

Load level and throughput

The chart below shows the throughput of Windows Server 2012 R2 patching for the 15-patch set. Throughput is measured in number of managed servers processed per minute. Throughput is computed by dividing the number of targets by the time required to complete the job.

The graphic below represents the average of two iterations for each managed server load level. The curve shows the optimal throughput at 1000 managed servers for the 15-patch set. This is about 7.2 managed servers patched per minute for a single-slice SA Core. For a double-slice SA Core configuration with 1000 managed servers, the optimal throughput is to 10.5 servers per minute.

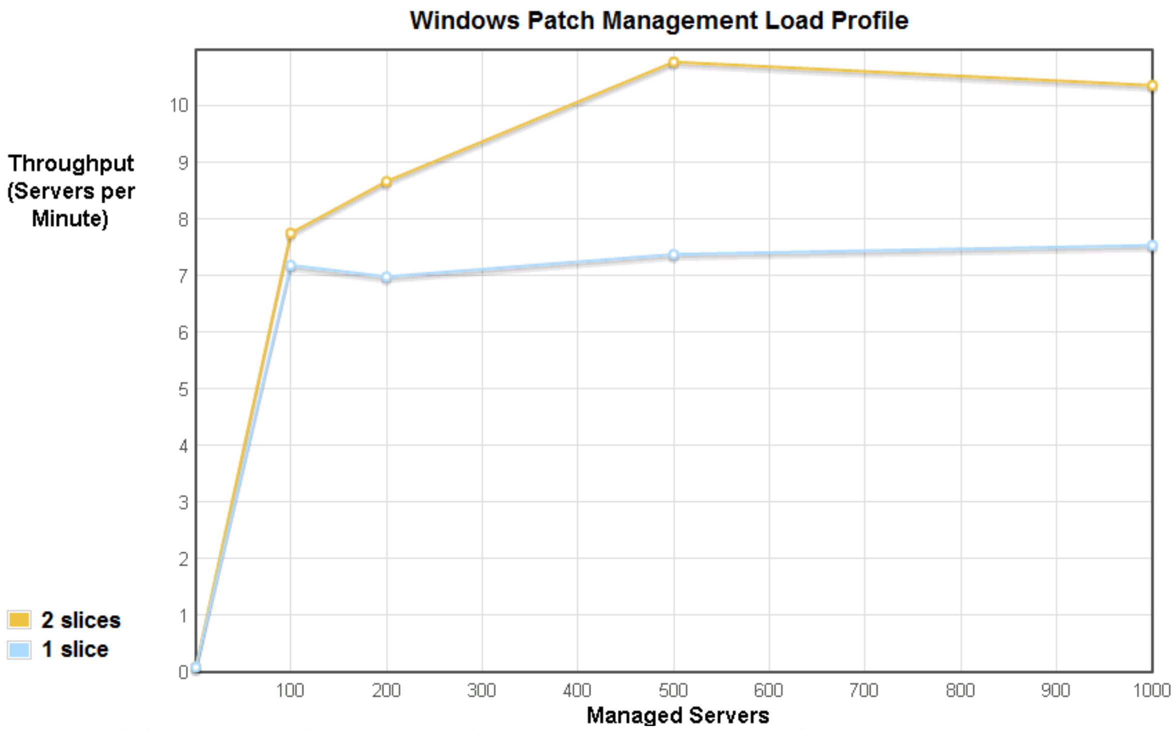

Figure 1: *Windows Patch Installation Job Throughput (Managed Servers per minute)*

Scalability within SA Core

The SA Core automatically distributes remediate workload across all SA slice servers within the Core.

In this way, for large remediate job submissions, throughput can benefit from the horizontal scalability of the slice server. Overall throughput increases as the number of slice servers is increased.

Workload characterization in SA Core

Windows patching in SA presents varying resource demands over the lifetime of the job.

The following series of graphics show the workflow and resource demands across selected parts of the SA core, for the same job. This job submission consists of a patch operation across up to 100 managed servers concurrently, in a one-slice SA Core and in a two-slice SA core configuration.

Workflow threads of the SA core

The following graphic shows 100 simultaneous patching operations for the 15-patch set in flight across the 100 target managed servers.

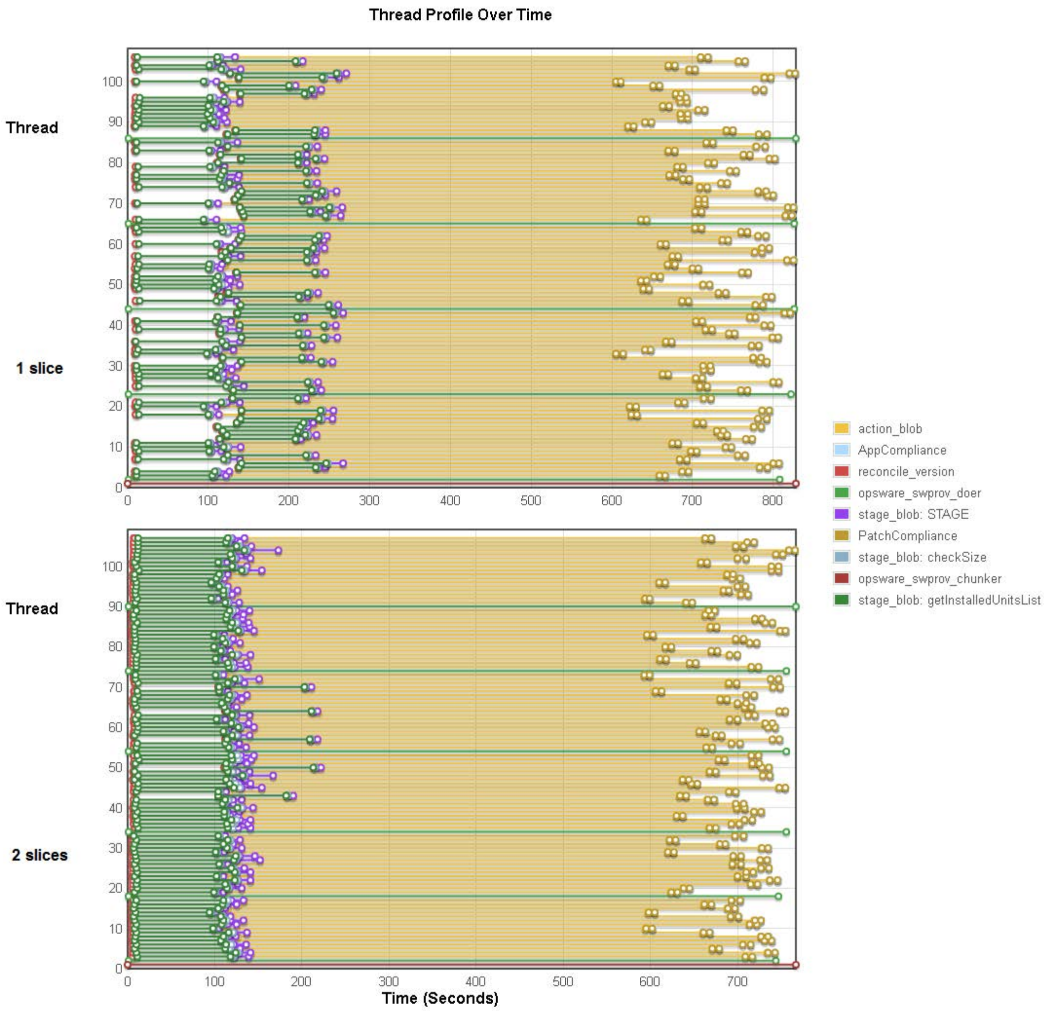

Figure 2: Concurrent Windows patching operations against 100 managed servers, 1 slice vs 2 slices

A Windows patch management job consists of a single "chunker" session which spawns one or more "doer" sessions. Each doer operates on one or more managed servers. Several SA system configuration parameters control how the chunker session distributes and limits the load of the job across these doer sessions and the SA Core as a whole.

In the diagram above, five doers operate on 20 managed servers, each for the single-slice configuration and six doers operate 16-17 managed servers for the two-slice SA Core configuration. Job sessions with more managed servers would have more doer sessions to handle them. Each managed server in the diagram above is managed by the first doer session below it and all doers are managed by the chunker session at the bottom. Besides the chunker and doer threads, the rest of the threads represent typical SA remediation job phases acting on each managed server: Analysis, Staging, Action Phase, Registration, and finally Compliance.

Tunable SA configuration parameters

The HPE Performance team adjusted the following system configuration parameters to facilitate stable operations:

Increase way.remediate.package_alarm_timeout

The remediate operation includes the action phase, which implies a workload on the managed server proportional with the payload being remediated.

When the number of managed servers in a job is large enough, this operation may reach the default timeout value of 3600 seconds. In this study, this value has been increased to 10200 seconds. You can turn off the value of this parameter from the SA Client[1].

Increase way.remediate.get_dicts_timeout

The *get_dicts_timeout* tuning parameter in SA is similar to *package_alarm_timeout*. It limits the number of seconds allowed for getting a list of installed software in the remediation action phase.

By default, this parameter is set to 1800 seconds but has been increased to 7200 seconds to work around timeout issues encountered at heavy workload levels. You can change the value of this parameter from the SAClient[2].

This test uses the default parameters for all the other configuration parameters.

Resource usage of SA core servers

This section details CPU and network usage of SA core servers when patching 100 managed servers.

All the SA Core servers are virtual machines running on separate ESXi hosts, each having sufficient CPU, RAM, and network bandwidth. The peak CPU usage of these servers is around 75-80%, with low average usage (under 20%). Most of the overall patching workload is performed by he native patching operation of the Windows 2012 R2 Server on the managed servers.

Resources usage and job duration is lower for the two-slice SA core setup (767s) compared to the single-slice-setup (828s).

[1] Administration View -> System Configuration / Configuration Parameters -> way.remediate.package_alarm_timeout
[2] Administration View -> System Configuration / Configuration Parameters -> way.remediate.get_dicts_timeout

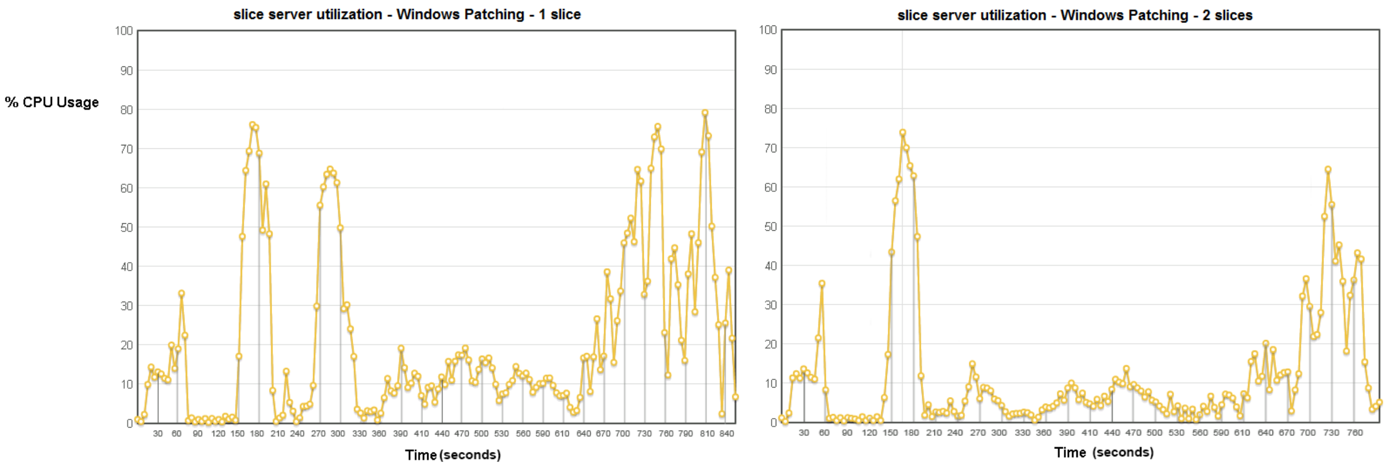

Figure 3: *CPU usage by a slice server for Windows Patching, one slice vs two slice, 100 managed servers*

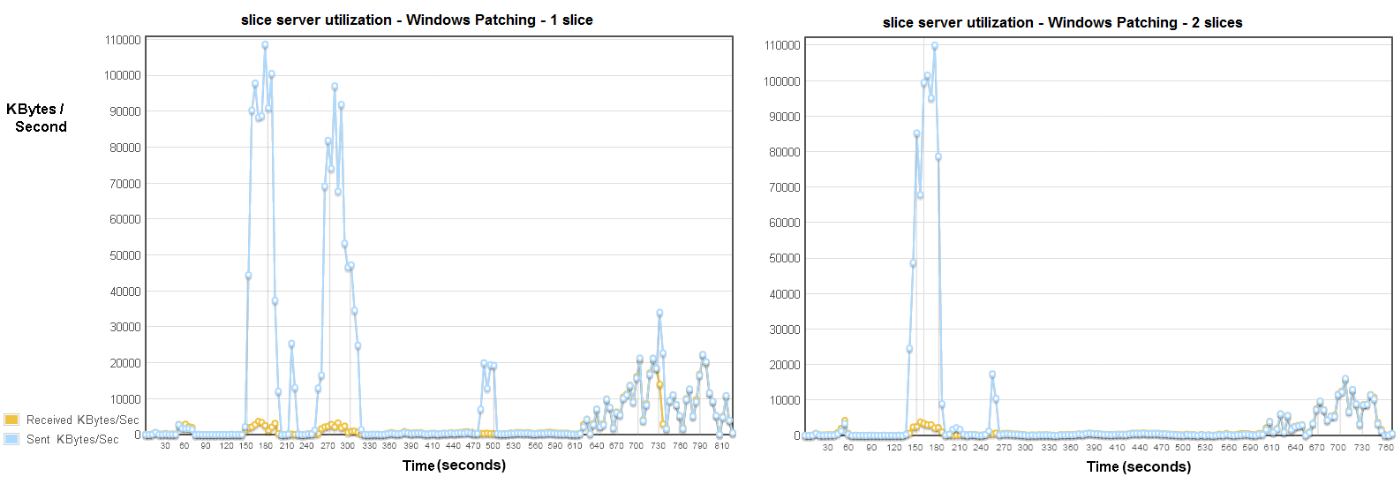

Figure 2*: Network usage by a slice server for Windows Patching, one slice vs two slice, 100 managed servers*

Conclusions

For the tested configuration, the test case yields an optimal throughput of 7.5 managed servers per minute for the 15-patch set on a single-slice SA core configuration and 10.3 managed servers for the two-slice SA core configuration. These are representative results dependent on the type, number, and size of the installed patches. Different representative patch sets would exhibit correspondingly different characteristics.

The workflow thread diagram demonstrates that jobs are submitted and executed concurrently as expected and with a better emphasis on the first phases of the job for the two-slice SA core setup.
The patch jobs flow through the various different workflow stages of the patch operation smoothly and complete in a timely fashion. For all Windows Patching use cases, the CPU load is roughly balanced across the two-slice servers, demonstrating that SA Windows Patch Management exhibits good balanced job distribution across the available slice servers.

The SA Core servers and managed servers run on virtual machines hosted in a number of VMware ESXi hosts. This limits the resources of CPU cycles and bandwidth to SAN (hosting the root disk images) available to the SA core servers and managed servers. At higher levels of concurrent workload, these resource limitations may skew the observed results.

Appendix: Test system configuration

SA Core servers

SA Core infrastructure	• Infrastructure & Slice services • Model Repository Multimaster Component (vault) • Data Access Engine (Spin - primary) • Gateways (mgw) • Media Repository (Word storage on NFS, SMB) • Model Repository Database (Truth)
ESXi host specifications	• ESXi 5.1 • HW: Model: HP ProLiant BL460c Gen9 • CPU: 16 CPUs x 2.6 GHz Intel Xeon E5-2640 • Memory: 256 GB
VM specifications	• Disk: 150 GB Linux ext4 • CPU: 8x vCPU @ 2.60 GHz , Memory: 32 GB
Network configuration	Network: 10 GBPS LAN, dedicated VLAN
Software specifications	• OS: RHEL6.7 64-bit • SA 10.50 (Build 65.0.70496.0)
SA Core Slice #1 and #2	• “Slice” scalable services • Command Engine (Way) • Secondary Spin • Web service API (Twist) • Opsware Global File System (Hub) • Word • Tsunami • Gateways (cgw, agw)
ESXi Host specifications	• ESXi 5.1 • HW: Model: HP ProLiant BL460c Gen9 • CPU: 16 CPUs x 2.6 GHz Intel Xeon E5-2640 • Memory: 256 GB
VM specifications	• Local Disk: 150 GB Linux ext4 • CPU: 8x vCPU @ 2.60 GHz , Memory: 32 GB
Network configuration	Network: 10 GBPS LAN, dedicated VLAN
Software specifications	• OS: RHEL 6.7 64-bit • SA 10.50 (Build 65.0.70496.0)

SA database	Oracle Database
ESXi Host specifications	• ESXi 5.1 • HW: Model: HP ProLiant BL460c Gen9 • CPU: 16 CPUs x 2.6 GHz Intel Xeon E5-2640 • Memory: 256 GB
VM specifications	• Local Disk: 150 GB Linux ext4 • CPU: 8x vCPU @ 2.60 GHz , Memory: 32 GB
Network Configuration	• Network: 10 GBPS LAN, dedicated VLAN
Software specifications	• OS: RHEL6.7 64-bit • Oracle Database 12c Standard Edition Release 12.1.0.2.0 – 64bit Production • SA 10.50 (Build 65.0.70496.0)

Managed servers

Managed servers	Windows 2012 R2 VMware VMs
ESXi Host specifications	• ESXi 5.1 • HW: Model: HP ProLiant BL460c Gen8 • CPU: 16 CPUs x 2.6 GHz Intel Xeon E5-2670 • Memory: 192 GB
VM specifications	• Local Disk: 40 GB • CPU: 2 vCPU @ 2.60 GHz , Memory: 4 GB
Network configuration	Network: 10 GBPS LAN, dedicated VLAN
Software specifications	OS: Windows 2012 R2 64-bit
Additional notes	VMs are evenly distributed across 28 VMware ESXi hosts

Send documentation feedback

If you have comments about this document, you can contact the documentation team by email. If an email client is configured on this system, click the link above and an email window opens with the following information in the subject line:

Feedback on Windows Patching Performance White Paper (Server Automation 10.50)

Just add your feedback to the email and click send.
If no email client is available, copy the information above to a new message in a web mail client, and send your feedback to hpe_sa_docs@hpe.com.

We appreciate your feedback!

February 2017