

Linux Patching Automation

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Purpose

End to end automation of entire work flow
of patching multiple Linux servers in parallel

Summary

- ▶ The patching automation function is part of the menu driven automation tool (IPUB) that cover 4 major related areas of Linux administration - Inventory, patch, upgrade and build.
- ▶ Language(s): python/perl/yml/SQL
- ▶ Infrastructure: satellite 6, Ansible Engine

What is automated?

- ▶ The tool was 128 bit password protected
- ▶ Menu driven so no shell command needed
- ▶ Automated inventory check with Satellite
- ▶ Automated verification
- ▶ Automated back up system configuration before and after patching
- ▶ Process multiple servers concurrently through the entire work flow
- ▶ Automated updating repository before patching
- ▶ Automated check file systems sizes before patching
- ▶ Automated applying correct activation key based on OS if needed
- ▶ Automated OS patching and reboot
- ▶ Automated Dry run option

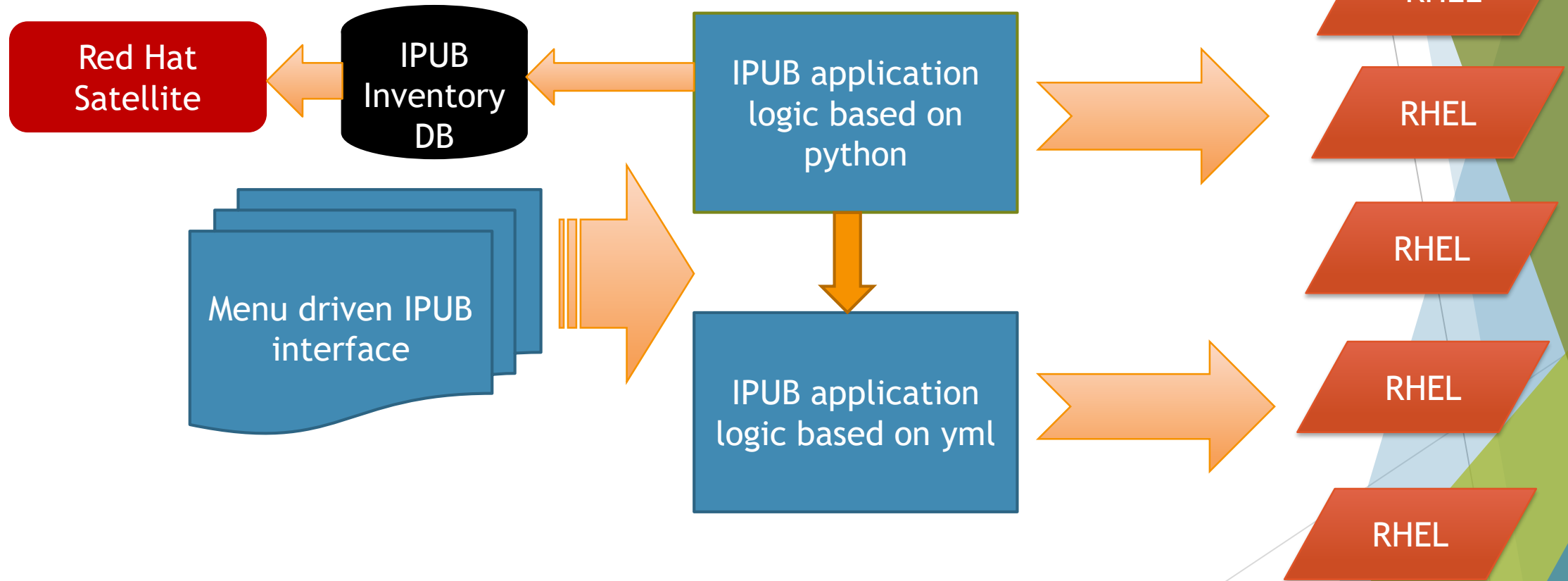
- ▶ Automated applying Exelon security baseline after successful patching
- ▶ Automated sync with current root password after successful patching
- ▶ Automated logging
- ▶ Automated auditing the work based on ticket# and staff email
- ▶ Automated generating consolidation PDF report of the session
- ▶ Automated option to email the report to the staff for record keeping
- ▶ Automated client side code to cover servers that are not reachable from automation server (server in SSN/DMZ)

Verified test cases

- ▶ verify user can only enter the tool if right password entered
- ▶ verify user must enter ticket number (to audit the work)
- ▶ verify user must enter email address (to audit the work)
- ▶ verify user can quit the tool at any time unless there is ongoing patching
- ▶ verify user will always be brought back to the menu after success/failure
- ▶ verify the tool can identify server that are not Red Hat and prevent action on it
- ▶ verify the tool can identify Red Hat server that are not managed by Satellite and report so
- ▶ verify the tool can identify Satellite managed server that is below 6.10 or 7.6 and report so
- ▶ verify the tool can identify invalid server name and prompt user such
- ▶ verify the tool can identify servers that is not pingable
- ▶ verify the tool can identify server that the ansible key is not deployed
- ▶ verify server that /boot size is too small and prevent action on
- ▶ verify server that /var size is too small and prevent action on
- ▶ verify server that has custom repo are moved before patching and restore afterwards

- ▶ Verified function if server list is entered directly to the tool
- ▶ Verified function if server is upload to a list file
- ▶ verify servers are properly backed up locally and to NFS share before and after patching
- ▶ Verify if server is patchable and if so report the kernel version and OS version it will be patched to
- ▶ Verify is server is already patched and report such
- ▶ Verify dry run function
- ▶ verify success and failure status of OS patching/reboot and report current kernel version and OS release on one/multiple servers
- ▶ verify only applying Exelon security baseline after successful patching
- ▶ verify success and failure of synchronization with current root password only after successful patching
- ▶ verify only patch RHEL 6.10 and above for RHEL 6 server
- ▶ verify only patch RHEL 7.6 and above for RHEL 7 server
- ▶ verified if OS version is lower than 6.10 or 7.6 and inform user upgrade is needed
- ▶ verify server was automatically rebooted right after patching
- ▶ verify log files was generated for the session
- ▶ verify both text and PDF based work auditing log was generated in centralized location
- ▶ verify the report include all work done for the ticket by the staff on the day
- ▶ verify user will receive the PDF report of the work log if he/she choose to receive one when quitting the tool
- ▶ verify user can wget the agent python code from satellite port 80/443 (for SSN or DMZ servers)
- ▶ verify function of agent python code on all existing RHEL major and minor releases (5,6,7) with all 3 options
- ▶ Verify the agent code will not patch servers if the OS version is not valid for patching

High Level Diagram

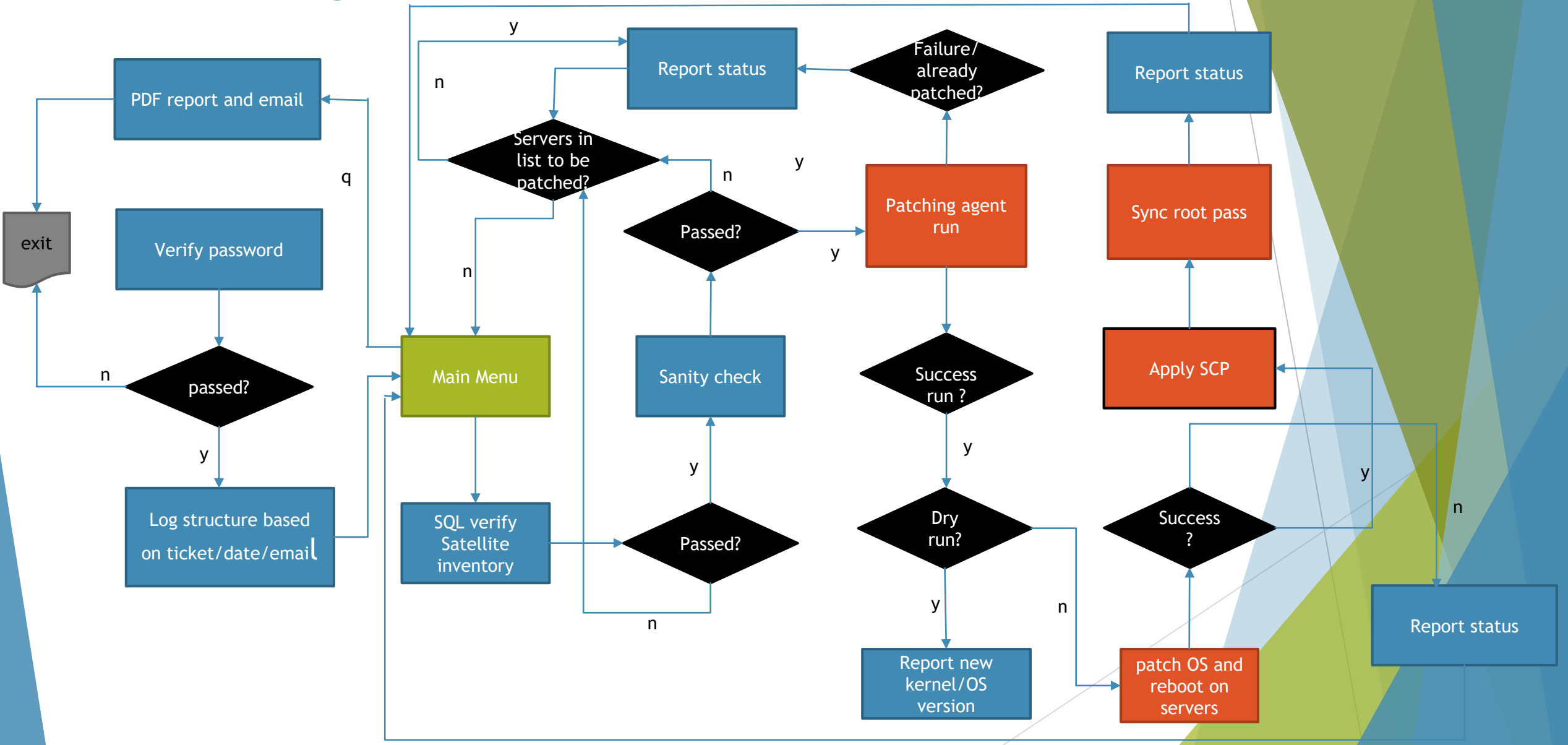


Data Logic

Separate python process running through daily cron to synchronize with remote Satellite system to update local sqlite3 database which in turn being used for inventory verification by the automation code



Process Logic



Presentation Logic

The background of the slide features a series of overlapping, semi-transparent geometric shapes, primarily triangles, in various shades of blue and green. These shapes are positioned on the right side of the slide, creating a modern, abstract design. The colors range from light blues to deep forest greens, with some darker blue tones. The overall effect is a clean, professional aesthetic.

Enter passwod:

WELCOME TO IPUB

Must Enter PRR/ODR/IM ticket to continue(q to exit): Test10

You entered: Test10

Must Enter email to continue(q to exit): run.zhang@exeloncorp.com

You entered: run.zhang@exeloncorp.com

Enter the tool

```
i - INVENTORY  
p - PATCH  
u - UPGRADE  
b - BUILD  
q - Quit
```

```
Enter choice: p  
Host name(s) to run on (type Ctrl+d when finished):  
Enter host list name (under /osconfigsnapshot/hosts/): hostlist4
```

Enter servers list to be processed

```
##### Checking inventory for below hosts #####  
uxbuild-ccc-03v uxbuild-omf-02v fusinp-msw-02 uxbuild-omf-08 linuxbu  
uild-etc-02 linuxbuild-omf-21 linuxbuild-ccc-11 linuxbuild-omf-22 dl  
  
..... Below hosts are not valid host managed by satellite .....  
uxbuild-omf-08  
  
..... Below hosts need to be upgraded .....  
uxbuild-ccc-03v.exelonds.com  
fusinp-msw-02.ceg.corp.net  
linuxbuild-omf-22.exelonds.com  
  
..... Below hosts can be patched .....  
uxbuild-omf-02v.exelonds.com  
linuxbuild-omf-01.exelonds.com  
linuxbuild-omf-02.exelonds.com  
linuxbuild-omf-03.exelonds.com  
linuxbuild-etc-02.exelonds.com  
linuxbuild-omf-21.exelonds.com  
linuxbuild-ccc-11.exelonds.com  
dl360-omf-11.exelonds.com
```

Inventory check

```
Must type y to proceed with the patching on above hosts( q to exit): y

##### Sanity check on below hosts #####

['uxbuild-omf-02v.exelonds.com', 'linuxbuild-omf-01.exelonds.com', 'lin
xelonds.com', 'linuxbuild-etc-02.exelonds.com', 'linuxbuild-omf-21.exel
0-omf-11.exelonds.com']

..... Below hosts passed the Sanity check .....

uxbuild-omf-02v.exelonds.com
linuxbuild-omf-01.exelonds.com
linuxbuild-omf-02.exelonds.com
linuxbuild-omf-03.exelonds.com
linuxbuild-etc-02.exelonds.com
linuxbuild-omf-21.exelonds.com
linuxbuild-ccc-11.exelonds.com
dl360-omf-11.exelonds.com
```

Sanity check

```
Must type y to proceed with the patching on above hosts( q to exit): y
```

```
..... Backing up system files and prepare environment for below hosts .....
```

```
['uxbuild-omf-02v.exelonds.com', 'linuxbuild-omf-01.exelonds.com', 'linuxbuild-omf-02  
xelonds.com', 'linuxbuild-etc-02.exelonds.com', 'linuxbuild-omf-21.exelonds.com', 'li  
0-omf-11.exelonds.com']
```

```
..... Syncing system configuraton back up files to NFS share for below hosts .....
```

```
['uxbuild-omf-02v.exelonds.com', 'linuxbuild-omf-01.exelonds.com', 'linuxbuild-omf-02  
xelonds.com', 'linuxbuild-etc-02.exelonds.com', 'linuxbuild-omf-21.exelonds.com', 'li  
0-omf-11.exelonds.com']
```

Backup and pre-check


```
Type y if its dry run (not actually upgrade and reboot):n

..... Below hosts will not be patched as they already been patched or nothing to patch ...

linuxbuild-omf-02.exelonds.com
linuxbuild-omf-03.exelonds.com

..... Below hosts will be patched and rebooted .....

uxbuild-omf-02v.exelonds.com
linuxbuild-omf-01.exelonds.com
linuxbuild-etc-02.exelonds.com
linuxbuild-omf-21.exelonds.com
linuxbuild-ccc-11.exelonds.com
dl360-omf-11.exelonds.com

..... New kernel versions after the patching and reboot.....

uxbuild-omf-02v.exelonds.com will be patched to new kernel version 3.10.0-957.10.1.el7
linuxbuild-omf-01.exelonds.com will be patched to new kernel version 3.10.0-957.10.1.el7
linuxbuild-etc-02.exelonds.com will be patched to new kernel version 2.6.32-754.12.1.el6
linuxbuild-omf-21.exelonds.com will be patched to new kernel version 3.10.0-957.10.1.el7
linuxbuild-ccc-11.exelonds.com will be patched to new kernel version 3.10.0-957.10.1.el7
dl360-omf-11.exelonds.com will be patched to new kernel version 3.10.0-957.10.1.el7
```

Dry run option

```
Must type y to proceed with the patch/reboot on above hosts( q to exit): y

..... Patching and rebooting below hosts, please be patient .....

['uxbuild-omf-02v.exelonds.com', 'linuxbuild-omf-01.exelonds.com', 'linuxbuild-etc-02.exelonds.com', '
xelonds.com', 'linuxbuild-ccc-11.exelonds.com', 'dl360-omf-11.exelonds.com']

..... Below hosts have been successfully patched and rebooted .....

uxbuild-omf-02v.exelonds.com
linuxbuild-omf-01.exelonds.com
linuxbuild-etc-02.exelonds.com
linuxbuild-omf-21.exelonds.com
linuxbuild-ccc-11.exelonds.com
dl360-omf-11.exelonds.com

..... Current kernel versions .....

uxbuild-omf-02v.exelonds.com has been successfully patched to new kernel version 3.10.0-957.10.1.el7
linuxbuild-omf-01.exelonds.com has been successfully patched to new kernel version 3.10.0-957.10.1.el7
linuxbuild-etc-02.exelonds.com has been successfully patched to new kernel version 2.6.32-754.12.1.el6
linuxbuild-omf-21.exelonds.com has been successfully patched to new kernel version 3.10.0-957.10.1.el7
linuxbuild-ccc-11.exelonds.com has been successfully patched to new kernel version 3.10.0-957.10.1.el7
dl360-omf-11.exelonds.com has been successfully patched to new kernel version 3.10.0-957.10.1.el7
```

Patching and reboot

```
..... Backing up system files for below hosts after patching.....
```

```
..... Syncing system configuraton back up files to NFS share for below hosts .....
```

```
['uxbuild-omf-02v.exelonds.com', 'linuxbuild-omf-01.exelonds.com', 'linuxbuild-etc-02.exelonds.com'  
xelonds.com', 'linuxbuild-ccc-11.exelonds.com', 'dl360-omf-11.exelonds.com']
```

Back up post patching reboot

```
..... Applying Exelon security baseline after patching .....  
  
['uxbuild-omf-02v.exelonds.com', 'linuxbuild-omf-01.exelonds.com', 'linuxbuild-etc-  
xelonds.com', 'linuxbuild-ccc-11.exelonds.com', 'dl360-omf-11.exelonds.com']  
  
..... Below hosts have been successfully applied Exelon security baseline .....  
  
uxbuild-omf-02v.exelonds.com  
linuxbuild-omf-01.exelonds.com  
linuxbuild-etc-02.exelonds.com  
linuxbuild-omf-21.exelonds.com  
linuxbuild-ccc-11.exelonds.com  
dl360-omf-11.exelonds.com
```

Enforce Exelon security baseline

```
..... Sync root password after patching on below hosts .....
```

```
['uxbuild-omf-02v.exelonds.com', 'linuxbuild-omf-01.exelonds.com', 'linuxbuild-etc-  
xelonds.com', 'linuxbuild-ccc-11.exelonds.com', 'dl360-omf-11.exelonds.com']
```

Sync current root password

```
i - INVENTORY  
p - PATCH  
u - UPGRADE  
b - BUILD  
q - Quit
```

```
Enter choice: q
```

```
Do you want to email the patch report (y|n)? y
```

```
Email sent to run.zhang@exeloncorp.com
```

Exiting the tool and email report



Wed 7/10/2019 4:45 PM

run.zhang@exeloncorp.com

RHEL patch work log attached

To ● Zhang, Run:(BSC)

Retention Policy Entire Mailbox - 2 Year Delete (2 years)

Expires 7/9/2021



appsansiblereportpatchTest11-run.zhang@exeloncorp.com-119-6-10.pdf
4 KB

Attached is sent by Exelon IPUB tool

Checking report

Test11
run.zhang@exeloncorp.com
2019-6-10

Checking inventory for below hosts

uxbuild-ccc-03v uxbuild-omf-02v fusinp-msw-02 uxbuild-omf-08 linuxbuild-omf-01 linuxbuild-omf-02 linuxbuild-omf-03

..... Below hosts are not valid host managed by satellite

uxbuild-omf-08

..... Below hosts need to be upgraded

uxbuild-ccc-03v.exelonds.com
fusinp-msw-02.ceg.corp.net
linuxbuild-omf-22.exelonds.com

..... Below hosts can be patched

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linuxbuild-omf-03.exelonds.com
linuxbuild-etc-02.exelonds.com
linuxbuild-omf-21.exelonds.com
linuxbuild-ccc-11.exelonds.com
dl360-omf-11.exelonds.com

..... Below hosts passed the Sanity check

uxbuild-omf-02v.exelonds.com
linuxbuild-omf-01.exelonds.com
linuxbuild-omf-02.exelonds.com
linuxbuild-omf-03.exelonds.com
linuxbuild-etc-02.exelonds.com
linuxbuild-omf-21.exelonds.com
linuxbuild-ccc-11.exelonds.com
dl360-omf-11.exelonds.com

..... Below hosts will not be patched as they already been patched or nothing to patch

linuxbuild-omf-02.exelonds.com
linuxbuild-omf-03.exelonds.com

..... Below hosts will be patched and rebooted

uxbuild-omf-02v.exelonds.com
linuxbuild-omf-01.exelonds.com
linuxbuild-etc-02.exelonds.com
linuxbuild-omf-21.exelonds.com
linuxbuild-ccc-11.exelonds.com
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linuxbuild-etc-02.exelonds.com
linuxbuild-omf-21.exelonds.com
linuxbuild-ccc-11.exelonds.com
dl360-omf-11.exelonds.com

..... Current kernel versions

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linuxbuild-omf-21.exelonds.com has been successfully patched to new kernel version 3.10.0-957.10.1.el7
linuxbuild-ccc-11.exelonds.com has been successfully patched to new kernel version 3.10.0-957.10.1.el7
dl360-omf-11.exelonds.com has been successfully patched to new kernel version 3.10.0-957.10.1.el7

..... Below hosts have been successfully applied Exelon security baseline

uxbuild-omf-02v.exelonds.com
linuxbuild-omf-01.exelonds.com
linuxbuild-etc-02.exelonds.com
linuxbuild-omf-21.exelonds.com
linuxbuild-ccc-11.exelonds.com
dl360-omf-11.exelonds.com

Future development

- ▶ Web / desktop version of the IPUB interface
- ▶ Add function to automatically generate post patching OS check report
- ▶ High availability
- ▶ Add capability run patching automatically according to preset schedule

The background features abstract geometric shapes, primarily triangles, in various shades of blue and green. These shapes are layered and overlap, creating a dynamic, modern aesthetic. The colors range from light, airy blues to deeper, more saturated greens and blues.

Questions?