

“How to Keep Critical Applications up and running 24x7”

Linda Wang
Red Hat, Inc.
October 6, 2016



Background

- Computer industry has been evolving
 - Decades of improvement
 - Various OS's claimed to be able to achieve Zero down time for their users, through various of individual mechanisms..
 - System monitoring
 - Predictive Self Healing
 - Without indepth analysis the fundamental causes of down time, do these features really help?

Today

- Open Source community
 - Ease of access to source
- Linux - lot of research and development in research institutes
- Opens doors and paths to different approaches and allows experimentation
- Advanced Kernel development

How to Achieve 24x7 Uptime

- Analysis the reasons behind down time
 - Planned vs Unplanned
- With unplanned, we want to proactively avoid it
 - Predictable vs Unpredictable

How to achieve 24x7 Uptime

- Reasons behind Down Times
 - Two types of Down-Time: unplanned vs. planned
 - Unplanned: predictable, unpredictable

| | Unpredictable/ Unplanned | Predictable/ Planned | Proactive Planning |
|------------------|-----------------------------|-------------------------|-----------------------|
| Application | Crash | | |
| Operating System | Panic | | |
| Hardware | Failure | | |

24x7 Uptime

- Reasons behind Down Times
 - Two types of Down-Time: unplanned vs. planned
 - Unplanned: predictable, unpredictable;

| | Unpredictable/ Unplanned | Predictable/ Planned | Proactive Planning |
|------------------|--|-------------------------|-----------------------|
| Application | Crash * Diag. - (gdb) * Auto restart - (systemd ufile) | | |
| Operating System | Panic * Diagnostic tool (kdump/crash) * Auto restart (NMI timeout) | | |
| Hardware | Failure * Error detection (HERM) | | |

24x7 Uptime

- Reasons behind Down Times
 - Two types of Down-Time: unplanned vs. planned
 - Unplanned: predictable, unpredictable;

| | Unpredictable/ Unplanned | Predictable/ Planned | Proactive Planning |
|------------------|--|-------------------------|-----------------------|
| Application | Crash * Diag. - (gdb) * Auto restart - (systemd ufile) | * Security updates | |
| Operating System | Panic * Diagnostic tool (kdump/crash) * Auto restart (NMI timeout) | | |
| Hardware | Failure * Error detection (HERM) | | |

24x7 Uptime

- Reasons behind Down Times
 - Two types of Down Time: unplanned vs. planned
 - Unplanned: predictable, unpredictable;

| | Unpredictable/ Unplanned | Predictable/ Planned | Proactive Planning |
|------------------|--|---|-----------------------|
| Application | Crash * Diag. - (gdb) * Auto restart - (systemd ufile) | * Security updates | |
| Operating System | Panic * Diagnostic tool (kdump/crash) * Auto restart (NMI timeout) | * Kernel security, bugfix updates | |
| Hardware | Failure * Error detection (HERM) | | |

24x7 Uptime

- Reasons behind Down Times
 - Two types of Down Time: unplanned vs. planned
 - Unplanned: predictable, unpredictable;

| | Unpredictable/ Unplanned | Predictable/ Planned | Proactive Planning |
|------------------|--|---|-----------------------|
| Application | Crash * Diag. - (gdb) * Auto restart - (systemd ufile) | * Security updates | |
| Operating System | Panic * Diagnostic tool (kdump/crash) * Auto restart (NMI timeout) | * Kernel security, bugfix updates | |
| Hardware | Failure * Error detection (HERM) | * Hardware replacement | |

24x7 Uptime

- Reasons behind Down Times
 - Two types of Down Time: unplanned vs. planned
 - Unplanned: predictable, unpredictable;

| | Unpredictable/ Unplanned | Predictable/ Planned | Proactive Planning |
|------------------|--|---|--|
| Application | Crash * Diag. - (gdb) * Auto restart - (systemd ufile) | * Security updates | * Live patching security fixes (systemtap) |
| Operating System | Panic * Diagnostic tool (kdump/crash) * Auto restart (NMI timeout) | * Kernel security, bugfix updates | |
| Hardware | Failure * Error detection (HERM) | * Hardware replacement | |

24x7 Uptime

- Reasons behind Down Times
 - Two types of Down Time: unplanned vs. planned
 - Unplanned: predictable, unpredictable;

| | Unpredictable/ Unplanned | Predictable/ Planned | Proactive Planning |
|------------------|--|---|--|
| Application | Crash * Diag. - (gdb) * Auto restart - (systemd ufile) | * Security updates | * Live patching security fixes (systemtap) |
| Operating System | Panic * Diagnostic tool (kdump/crash) * Auto restart (NMI timeout) | * Kernel security, bugfix updates | * Live patching known kernel issues (kpatch) |
| Hardware | Failure * Error detection (HERM) | * Hardware replacement | |

24x7 Uptime

- Reasons behind Down Times
 - Two types of Down Time: unplanned vs. planned
 - Unplanned: predictable, unpredictable

| | Unplanned Down Time | Planned Down Time | Proactive Planning |
|------------------|--|-----------------------------------|--|
| Application | Crash * Diag. - (gdb) * Auto restart - (systemd ufile) | * Security updates | * Live patching security fixes (systemtap) |
| Operating System | Panic * Diagnostic tool (kdump/crash) * Auto restart (NMI timeout) | * Kernel security, bugfix updates | * Live patching known kernel issues (kpatch) |
| Hardware | Failure * Error detection (HERM) | * Hardware replacement | *Checkpoint/R estore (criu) |

Prepare for DownTime Scenarios

- Preventive Measures
 - For security fixes and known issues to avoid crashes
 - Live Patches - for both kernel and userspace
- To avoid Down Times due to Hardware Failure or Regular Maintenance
 - Containerize critical applications, and use Live Migration to move to alternative systems while original systems under-going maintenance to avoid down time

Kernel Live Patching Enhancements

- Demo

Use Space Live Patching

- Demo

Container Migration

- Demo

For more information...

Kernel Live Patching:

- <http://rhelblog.redhat.com/?s=live+patching>
- questions: kpatch@redhat.com

● Checkpoint Restore/Live Migration:

- <http://rhelblog.redhat.com/?s=criu>
- questions: criu@redhat.com

A night sky with the Milky Way galaxy visible. In the foreground, there is a silhouette of a large tree on the left and a satellite dish on a hill in the center. The text "Thank-you!" is centered in the sky.

Thank-you!