VMware, Inc. Invention Disclosure Form

Overview

File #: B181.ID

Title*

HOT PATCHING OF VMX

Technology Group:

Technology Group Category*

Miscellaneous

Product or Technology*

Miscellaneous - Other

Received Date

2/18/2013

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Disclosure

Previous Public Disclosure:

Has this invention been made known to anyone outside of VMware and not subject to an NDA?*

No

When?

How?

Anticipated Public Disclosure:

Outside of a non-disclosure agreement (NDA), is there any planned disclosure of this invention or release of a product incorporating this invention to anyone outside of VMware?

No

When?

How?

Supporting Documents:

Documents and Attachments:	
Document Name	**Subject**

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Third Party Interest

Development Funding:

Is the development of this invention being funded by an agency of the U.S. Government?*

No

Agency

Contract Number

Special Contract Limitations:

Are you under a duty to maintain any aspect of this invention in confidence or to assign all or any part of it to any other individual (for example, business partner), company (for example, previous employer), organization, or educational institution?*

No

Describe

Have you developed all or any part of this invention using the equipment, consulting services, or facilities of any other individual, company, organization or educational institution?*

No

Describe

Do you know of any other potential limitations to VMware's exclusive right to own or develop this invention?*

No

Describe

VMware Project:

Is the development of this invention related to a current VMware Project?*

No

Enter Name (or Codename) of Project:

Is this a project that VMware is collaborating on with a third party (or parties)?*

Enter Name of Third Parties:

Supporting Documents:

Documents and Attachments	
Document Name	**Subject**

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Invention Description

Problem to be Solved:

What problem does the invention solve?*

This invention solves hot patching of VMX. VMX (Virtual Machine eXcecutable) is the program running ESXi for each VM instance, which contains devices virtualization, CPU virtualization (monitor) and all bios binaries and is executed to create the main VMX user world and dynamically generate monitor for each VM instance.
The problem is:
As cloud infrastructure lead, VMware has huge growing ESXi deployed in customer's datacenter, which brings more complexity customer issues reported. One of the most important is from VMX---the base of virtual machine, lots of such kind critical issues can only be reproducible on customer's real world environment in conjunction with extended 7x24 non-stop running. Although home reproducing is almost impossible, fix is really critical needed for customer.
Hot patching for VMX can apply debug patches and critical fix patches to running VMX without having to reboot.The hot patch could benefit customer to collect and analyze information in the first scene. If needed, vHop also can safely reverse VMX to original standard one.

Summary of the Invention:

Briefly, summarize the invention and how it solves the stated problem.*

The invention project named vHop: abbreviation for hot patching of VMX project is to apply debug patch or fix patch to VMX without rebooting.
vHop mainly contains two subsystems, one is hot patch creator which is one offline user world tool chain . Another is hot patch manager which works at kernel mode to uninterruptedly insert patch based on current memory state.Hot patch creator solves two primary tasks: generating hot patch source code, compiling patch and resolving symbol conflict. Hot patch manager helps insert the generated patch to live VMX memory and let the new code run instead of old ones.

This invention first time implements hot patching for user world process launched from executable shared object ELF and first time implements hot patching of VMX for ESXi. When creating hot patch, vHop patch generator first time introduces "dead code" area and composes reserved section, "dead code" and shared object three different forms on different hot patch size conditions. And vHop uses its unique methods to generate the hot patch private header and checksum.

Details in the attached paper.

Prior Art:

How have others tried to solve the problem and in what ways have their solutions been inadequate?

Ksplice(http://www.ksplice.com) has implemented hot patch for Linux kernel, but not for user world executable shared object ELF. And for our specific VMX, we implements complete different patch generator toolchain and implement unique ESXi kernel module for executable shared object ELF. And we also design and implement one mechanism combine three different form hot patching format when hot patch in different sizes. And when generating hot patch, we design our own method for hot patch private header and checksum.

Supporting Documents:

Documents and Attachments	
Document Name	**Subject**
vHop--Hot Patching of VMX.pdf	Hot Patching of VMX

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