coreboot - Bug #121

T520: Hangs in OS

06/09/2017 06:36 AM - Julz Buckton

Status:	New		**Start date:**	06/09/2017
Priority:	Normal		**Due date:**	
Assignee:			**% Done:**	0%
Category:			**Estimated time:**	0.00 hour
Target version:				

Description

I have been running coreboot since 2017.04.15 and have experienced hangs ever since then. It was suggested by folk on the IRC that I run memtest to check for incorrect raminit causing errors, however I have run memtest for 12 hours straight with no errors.

Due to the ambiguous nature of the hangs (immediate freeze with no warning signs, audio gets stuck repeating the last 50ms or so of noise, not sure what this effect is called) I don't have much useful information other than the .config and dmesg. However one thing I can say with high confidence is that the hangs occur significantly more frequently in Linux (*buntu distros) than Windows 10. Within an hour of launching Linux a hang is likely, whereas Windows typically runs for many hours before a hang occurs. I considered this an insignificant anecdotal anomaly at first but over the course of the nearly 2 months I have been running coreboot it seems to be a solid trend. The hangs occur anywhere, typically during mere desktop usage or basic web browsing.

Additionally there is another form of hang I experience where the screen goes black except for some sort of graphical corruption down the left side (http://i.imgur.com/4zWrlpX.jpg), whether this is related to the more common total freeze hangs I don't know but I figured I should include it nonetheless. These hangs only occur about 1:20 compared to the regular hangs.

History

#1 - 06/09/2017 06:39 AM - Julz Buckton

https://mail.coreboot.org/pipermail/coreboot/2016-September/082009.html

According to this entry on the mailing list someone else was getting the same issue on their T520. I have tried limiting the max mem speed to 666 in devicetree.cb as suggested in the link, however it did not fix the issue as expected since my RAM is only 1333 anyway. The second suggestion (limiting CPU p-state), I wouldn't know how to do.

#2 - 06/15/2017 01:32 PM - Nico Huber

Does your T520 have a dedicated GPU or the integrated Intel GPU only?

#3 - 06/15/2017 09:55 PM - Julz Buckton

Integrated only.

#4 - 06/19/2017 06:38 AM - Iru Cai

What is the longest uptime before the system hangs in Linux?
How long the system can run before it hangs when you run some heavy loads (e.g. boinc) or do a lot of network transfer?

Also, I suggest you try revision 39937cc2fd28bcc754c0595f1327467499af40ea in which Lenovo T520 is still using mrc.bin blob. I'm now running it the first time and the system has run for >5 hours. However, I don't know if it's still stable in the future boots.

#5 - 06/23/2017 09:06 PM - Vasya Boytsov

I have the same issue on t420 with 3632qm. And I accidentally found out that my laptop works more than 2 days without any hangs while I was using the x220 kernel config which had maxcpus set to 4. When I changed this value to 8 in the kernel config those hangs came back. I don't remember whether the maxcpus=7 worked the same way or not.

#6 - 06/23/2017 09:44 PM - Julz Buckton

Iru Cai wrote:

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I am lucky to get 1 hour uptime in linux. Heavy loads on windows seem to prevent the hangs, I have run Linpack and some GPU benchmarks multiple times for 6+ hours at a time with no hang, and have never seen a hang during such programs. This doesn't seem to be the case on linux, where I frequently get hangs during the crossgcc build stage of the coreboot build, which I assume is running the CPU high. Network activity does not seem to prevent the hangs, furthermore the most common hang scenario for me now is when the laptop was left for some hours with only a torrent client running, where it is unlikely to not hang after 2 hours.

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I already using a 4 CPUs chip though (i5-3320M). Perhaps I could try setting maxcpus=2 in config.

#7 - 06/24/2017 03:32 PM - Iru Cai

Julz Buckton wrote:

> Iru Cai wrote:
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with only a torrent client running, where it is unlikely to not hang after 2 hours.

Have you tried mrc.bin yet, e.g revision 39937cc?
I've tried this revision and the first revision that uses native ram init, and it seems that native ram init is the problem. I just don't know if mrc.bin supports ivy bridge yet.

> Vasya Boytsov wrote:
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#8 - 06/24/2017 03:41 PM - Iru Cai

Vasya Boytsov wrote:

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Linux kernel config?
I remember I haven't have any issue on an iGPU only T420. My last working revision is 8bbd596de631adc8b677e69603e978b848eb1708.

#9 - 06/24/2017 05:35 PM - Vasya Boytsov

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Yes, I've changed this setting in the Linux kernel config, compiled the kernel and it works flawlessly now. The last time I was testing was between 4.5 and 4.6 don't remember the exact revision. So, the problem should be connected with native ram init, I'll try earlier revisions later. How can one be of help with debugging of this issue?

#10 - 06/24/2017 09:11 PM - Julz Buckton

Iru Cai wrote:

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I've tried this revision and the first revision that uses native ram init, and it seems that native ram init is the problem. I just don't know if mrc.bin supports ivy bridge yet.

You mean this version? https://review.coreboot.org/cgit/coreboot.git/commit/?id=39937cc2fd28bcc754c0595f1327467499af40ea

I will give it a try. Could native ram init really be the cause of the issue, even if I got no errors in memtest?

#11 - 06/25/2017 02:32 AM - Julz Buckton

Tried coreboot revision 39937cc2fd28bcc754c0595f1327467499af40ea (with systemagent-r6.bin, tried systemagent-ivybridge.bin first and got brick) and got a hang within 30 seconds of booting into linux. Guess that rules out RAM init being the cause of hangs?

#12 - 06/29/2017 11:59 PM - Julz Buckton

- File cbmem-raminit.txt added

Here is cbmem output with verbose RAM init logging enabled, in case it is helpful.

#13 - 07/06/2017 04:30 AM - Julz Buckton

I managed to get my hands on another SNB chip (i3-2310M) and with the same config (with just PCI ID for vga blob changed from 8086:0166 to 8086:0126), I get no hangs.

So looks like T520 mainboard + Ivy Bridge chip is cause for hangs.

#14 - 07/13/2017 03:16 PM - Iru Cai

Julz Buckton wrote:

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> So looks like T520 mainboard + Ivy Bridge chip is cause for hangs.

Maybe related to turbo boost? Although the machine often hangs at idle time.
Because the system hang also happens when I use a Sandy Bridge Dual/Quad core processor.

#15 - 11/17/2017 07:00 PM - Patrick Rudolph

Vendor does dynamically limit pstate depending on attached power supply.
ATM coreboot doesn't care about attached PSU...

Example:
The battery charges at 45 Watt.
The CPU has a TPD of 45 W.
7W idle power.
Other components, including USB 10W ?

It would require a 135 Watt PSU or limiting the CPU TDP / battery charge current to a smaller value.

What power-rating does your PSU have ?

#16 - 07/30/2018 03:30 PM - Seff Qin

Test v4.8.1 with t420, this issue has not been fixed.

I got different informations by executing 'dmidecode -t 17':
Vendor BIOS: Total Width and Data Width are both 64 bits.
Coreboot: Total Width is 16 bits and Data Width is 8 bits.

It seems that the RAMs are not running at full speed.

#17 - 09/28/2018 03:41 PM - Evgeny Zinoviev

Having hangs on T520 + i5-2450M. Happened twice after ~1 min after booting debian (devuan). The interesting part is that it unfreezes after 4-5 minutes. I'm using two 4G Hynix RAM sticks, 8G in total. I'll see if maxcpus=2 helps.

#18 - 09/28/2018 06:09 PM - Evgeny Zinoviev

Update: maxcpus=2 didn't help

#19 - 10/01/2018 01:58 PM - Nico Huber

Evgeny Zinoviev wrote:

> Update: maxcpus=2 didn't help

Please note that the original report was for an Ivy Bridge CPU in a T520 (probably caused by missing compatible ME firmware or whatnot). You seem to have a very different problem.

#20 - 03/02/2019 11:51 AM - Evgeny Zinoviev

Now I have X220 with this bug. Yeah I know that the original report is for IVB CPU in T520, but i've seen both symptoms and they are the same: (1) just a hang and (2) a black screen with fluttering red line at the left, like on the photo from the last paragraph of this ticket.

Doesn't happen with lenovo bios. For now I suspect it's something RAM related (just have no other ideas). I'm using 2x8Gb Patriot PSD38G16002S sticks. I'll try to use different sticks and see if it helps. What else can I do to debug this? At least I have a hardware on which we can reproduce this, that's something for a start.

#21 - 06/03/2019 07:18 PM - Evgeny Zinoviev

Recent observations on X220.

Using most recent CPU microcode doesn't help.
Not using CPU microcode at all doesn't help.
Disabling HT with patch #29669 doesn't help.
Using mrc.bin instead of native raminit doesn't help.
Changing DIMMs doesn't help.
Using stock or neutered ME doesn't help.

Using OEM BIOS helps, of course, but that's not a solution.

#22 - 06/03/2019 09:53 PM - Evgeny Zinoviev

A also have a feeling that this happens more often when using virtualization (qemu/kvm). I'd say if I run virtual machines, the lockup is likely to happen in hour or so.

#23 - 06/28/2019 04:31 AM - Viktor V

Evgeny Zinoviev wrote:

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>
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>
> Using OEM BIOS helps, of course, but that's not a solution.

I have exactly the same problem, my X220 randomly hangs with that weird glitch in the left side of the screen. My build settings are pretty much defaults with SeaBIOS and Intel ME disabled.

Using Debian with 2x4 Gb RAM and i5-2520M CPU.

By the way, I'm also from Russia. :)

#24 - 06/28/2019 03:08 PM - Evgeny Zinoviev

Viktor V wrote:

> I have exactly the same problem, my X220 randomly hangs with that weird glitch in the left side of the screen. My build settings are pretty much defaults with SeaBIOS and Intel ME disabled.
>
> Using Debian with 2x4 Gb RAM and i5-2520M CPU.
>
> By the way, I'm also from Russia. :)

I'm glad to hear I'm not the only one. Did you update Lenovo BIOS to the latest version before extracting ME and flashing coreboot?

We had a discussion about these hangs on #coreboot and came up with two ideas:

1. Make sure we use most recent ME firmware.
2. Collect revisions and stepping ids of the Intel chips in faulty machines and compare them to the working ones.

#25 - 06/28/2019 09:01 PM - Viktor V

> Did you update Lenovo BIOS to the latest version before extracting ME and flashing coreboot?

Yes, I did. It was version 1.45, but now it's already 1.46 available released in June 26 2019.

> Collect revisions and stepping ids of the Intel chips in faulty machines and compare them to the working ones.

Can I help with providing this information? Not sure what revision and stepping id are, how can I see them in Debian? I've built coreboot 4.9 release.

I assumed that X220 is the most stable hardware for coreboot. Honestly, my very first thought was that this hang is caused by some kind of a failed BIOS exploit by some malware. (LOL I'm paranoid)

#26 - 06/28/2019 11:24 PM - Evgeny Zinoviev

Viktor V wrote:

> Can I help with providing this information?

I hope so. Won't hurt anyway.

> Not sure what revision and stepping id are, how can I see them in Debian?

I guess, lspci and cat /proc/cpuinfo

> I assumed that X220 is the most stable hardware for coreboot.

It is believed to be very stable. Actually, I used to use an X220 (another one) for year and a half and never had a single crash or hang. This bug is quire rare, only some mainboards (or CPUs, or something) are affected and, at the moment, we have no idea why. This bug is known to occur only on SNB thinkpads, so, in this sense, X230 is probably more "stable".

> Honestly, my very first thought was that this hang is caused by some kind of a failed BIOS exploit

Well, you have replaced your BIOS with coreboot, haven't you? ;)

Another idea: try disabling cstates and see if it helps. I was going to try it myself but I doubt I'll have time for it earlier than next week.

#27 - 06/29/2019 06:46 AM - Viktor V

- File cpuinfo.txt added

- File lspci.txt added

Attaching lspci and cpuinfo outputs

#28 - 07/02/2019 07:50 AM - Viktor V

Evgeny Zinoviev wrote:

> Another idea: try disabling cstates and see if it helps. I was going to try it myself but I doubt I'll have time for it earlier than next week.

Looks like it works! I've added "intel_idle.max_cstate=0 processor.max_cstate=1" kernel parameters and it runs for 2 days without hangs so far.

#29 - 07/02/2019 08:37 AM - Viktor V

Some strange things I've experienced while flashing this X220.

Every tutorial online says you can flash X220 with Raspberry Pi SPI interface, but I had no luck with it. Flashrom couldn't detect the chip, though it reads/writes fine with RPi on my other laptops. So I had to buy and use ch341a USB programmer (black version).

With ch341a Flashrom works fine, but it shows strange warnings while writing:

Found Macronix flash chip "MX25L6405" (8192 kB, SPI) on ch341a_spi.
Reading old flash chip contents... done.
Erasing and writing flash chip... FAILED at 0x00001000! Expected=0xff, Found=0xf0, failed byte count from 0x00000000-0x0000ffff: 0x1cf9
ERASE FAILED!
Reading current flash chip contents... done. Looking for another erase function.
Erase/write done.
Verifying flash... VERIFIED.

cbmem output says it has SF: Detected MX25L6405D with sector size 0x1000, total 0x800000

Edit: Right, sorry about that. Just trying to understand differences between this unstable X220 and other stable ones.

#30 - 07/02/2019 08:48 AM - Paul Menzel

Please contact the flashrom mailing list for the flashrom issue as it's unrelated to the coreboot bug tracker and the issue at hand specifically.

#31 - 07/05/2019 12:17 PM - Viktor V

Those hangs must be related to CPU C-states for sure. After 4 days of stable uptime, I've changed back kernel parameters to default and rebooted my X220. It randomly hanged with that glitch on the left side of the screen after just 8 hours of work.

The temporary fix on a Linux system is to run kernel with parameters "intel_idle.max_cstate=0 processor.max_cstate=1".

For example, on Debian I do:

```
echo GRUB_CMDLINE_LINUX_DEFAULT=\"\$GRUB_CMDLINE_LINUX_DEFAULT intel_idle.max_cstate=0 processor.max_cstate=1\" >
/etc/default/grub.d/corebootfix.cfg
sudo update-grub
```

Hoping this information is useful.

#32 - 07/05/2019 12:25 PM - Evgeny Zinoviev

Viktor V wrote:

> Those hangs must be related to CPU C-states for sure. After 4 days of stable uptime, I've changed back kernel parameters to default and rebooted my X220. It randomly hanged with that glitch on the left side of the screen after just 8 hours of work.
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> /etc/default/grub.d/corebootfix.cfg
> sudo update-grub
> ```
>
> Hoping this information is useful.

Nice! Thank you very much. After months of hangs we finally understand something.

#33 - 07/07/2019 06:55 AM - Martin Zwicknagl

Hello all,

I can confirm that
intel_idle.max_cstate=0 processor.max_cstate=1
seems to fix the problem.

I also tried:
intel_idle.max_cstate=1 processor.max_cstate=2
The T520 is running for more than three days now, without freezes.

Hope this helps.

#34 - 07/07/2019 01:31 PM - Evgeny Zinoviev

Martin Zwicknagl wrote:

> Hello all,
>
> I can confirm that
> intel_idle.max_cstate=0 processor.max_cstate=1
> seems to fix the problem.
>
> I also tried:
> intel_idle.max_cstate=1 processor.max_cstate=2
> The T520 is running for more than three days now, without freezes.
>
> Hope this helps.

Do you mean that intel_idle.max_cstate=1 processor.max_cstate=2 is also stable?

#35 - 07/07/2019 01:45 PM - Nico Huber

AFAIK, intel_idle and ACPI processor are two independent drivers. Does this mean you tested both? if not, please always mention which one was effective, cf. cat /sys/devices/system/cpu/cpuidle/current_driver. Otherwise, the information "processor.max_cstate=2 works", for instance, may be very misleading if the processor driver wasn't used at all.

#36 - 07/07/2019 03:01 PM - Martin Zwicknagl

Nico Huber wrote:

> AFAIK, intel_idle and ACPI processor are two independent drivers. Does this mean you tested both? if not, please always mention which one was effective, cf. cat /sys/devices/system/cpu/cpuidle/current_driver. Otherwise, the information "processor.max_cstate=2 works", for instance, may be very misleading if the processor driver wasn't used at all.

Ups, I was not aware of the difference. cat /sys/devices/system/cpu/cpuidle/current_driver shows intel_idle so I think I have tested intel_idle.max_cstate=1

#37 - 07/13/2019 06:13 PM - Martin Zwicknagl

Hello,

I want to tell you, that the Laptop does NOT freeze with
intel_idle.max_cstate=1, intel_idle.max_cstate=2 and intel_idle.max_cstate=3

with
intel_idle.max_cstate=4, intel_idle.max_cstate=5 and intel_idle.max_cstate=6
it freezes.

#38 - 08/22/2019 10:56 AM - Evgeny Zinoviev

My X220 just hung with intel_idle.max_cstate=3 :(

#39 - 09/01/2019 04:22 PM - Alexander Wetzel

I'm using coreboot since roughly six month on a thinkpad w530 (i7-3820QM, K2000M and 24GB of RAM with ME neutered) and have what looks like the same issue.
Now I did have an custom modification to coreboot but I've build and flashed fad9536edf yesterday without it and already had a few of the freezes. After reproducing the freezes without the mod I've it installed again. (Based on https://review.coreboot.org/c/coreboot/+/28380, just fixed an rather serious error in DSDT so windows boots with it.)

So I have those freezes with or without this mod, regardless if I set hybrid_graphics_mode to integrated, discrete or dual mode. (Using the discrete card seems to freeze the system more often, but that may also just have been bad luck.)
The freezes always happen with a load close to idle: While I had a few booting up the system it normally occurs when putting the system aside for a short moment after some light browsing or text file editing. But I also can have the idle system just sitting there for hours without hitting it. I get the impression that either putting it aside or picking it up again has a chance of triggering the bug and needed quite some time to accept that it's probably not the movement itself. (I got a new PSU, since it stopped charging the notebook sometimes on movements. The new PSU fixed the stop/resume charging issue - broken cable in the old PSU - but not the freezes.

Now when it freezes it's always the same: The screen freezes, any LED's which normally may flash are staying either lit or unlit. So far I did not had any screen corruption, though.
(Sound is normally muted, so I can't say if there are audio artefacts.)

But I have also an additional symptom after switching to coreboot which could be linked to the problem and if so could be very helpful for debugging it:

I'm also using gentoo and sometimes there are some painful software updates, keeping the CPU at 100% for hours.
Sometimes - less frequent in more current coreboot versions - when having such a big update the CPUs stop using the max speed (around 3491 MHz) and are stuck at a much lower speed. (I think it was around 2 GHz). All cores are still working 100% but the CPU power reduced, resulting in drastically longer compile times.
I tried some months ago to figure out why, but there was nothing in the logs and the CPU governor still reported the normal limits. For some undetermined reason the CPUs just did not use the higher frequencies till I rebooted. Some time later I figured out how to fix the stuck CPU frequency without rebooting: Suspending the system to RAM and resuming it. (Which is basically a CPU reboot after all.)
Since the system is still fully operational when I hit this bug I can execute basically anything. Are there anything I should gather when I get my system into that state next time?
Unfortunately I get into that state much less often than the freezes... But I guess I could try forcing the issue and let the system sit in a corner recompiling dev-qt/qtwebengine, the package most likely to triggering the bug for me.

Noteworthy here is, that with more recent coreboot versions I hit the CPU throttling bug much less frequent. Maybe once in the last two months, while getting it within maybe 30min compiling packages some time back. Normally it takes quite some time (>1h?) of 100% CPU to trigger this bug. Now I had quite some big updates in the past not triggering it, (un)fortunately.

But with time I'm sure I can trigger it again, either accidentally or forced. If you have suggestions what do do when I get into that state next I'll do that on top of what I can think of myself (Which is not much, to be honest. Still pretty new to coreboot...)

#40 - 09/01/2019 04:53 PM - Evgeny Zinoviev

Hello, Alexander.

That's sad. Until this moment I believed this bug affects at least only xx20 ThinkPad series. By the way I use corebooted W530 too (i7-3720QM, then i7-3940XM, 32GB RAM, neutered ME) for over a year and never ever had a single crash or freeze.

> just fixed an rather serious error in DSDT so windows boots with it

Can you upload a fix somewhere? I'll update the patch on Gerrit.

> The freezes always happen with a load close to idle
> Now when it freezes it's always the same: The screen freezes, any LED's which normally may flash are staying either lit or unlit. So far I did not had any screen corruption, though.

This is also what I see on X220. The crash is more likely to happen when idle. Sometimes there is video corruption, sometimes it just stucks.

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Two suggestions.
1. CPU is throttling because the temperature is too high. Not likely.
2. I know how to reproduce a similar frequency drop, just put lower power adapter, not this huge 170W brick that comes with W530, but for example 90W one or 65W one. The CPU frequency will immediately drop to ~1200 MHz and the only way I know to fix this is to perform suspend/resume or reboot. But sometimes this happens to my W530 with original 170W brick, just as you say, maybe once in two months or so. I just didn't really bother debugging this.

Please post your lspci and cat /proc/cpuinfo | grep stepping output (I want to compare hardware revisions with mine). I'm collecting information about affected and non-affected machines, maybe I'll see some pattern, idk.

#41 - 09/01/2019 09:29 PM - Alexander Wetzel

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Really a strange bug...

> just fixed an rather serious error in DSDT so windows boots with it

Can you upload a fix somewhere? I'll update the patch on Gerrit.

I was planning to work on that a bit more, this is basically only a forward ported version of my very first shot at coreboot patching without caring about other platforms...
The idea was to polish it prior to contacting you:-)... That said here what I have: https://www.awhome.eu/index.php/s/GBfFb2Et768cQWM
Since that is highly off-topic I've added the comments for that to the patch.

> The freezes always happen with a load close to idle
> Now when it freezes it's always the same: The screen freezes, any LED's which normally may flash are staying either lit or unlit. So far I did not had any screen corruption, though.

This is also what I see on X220. The crash is more likely to happen when idle. Sometimes there is video corruption, sometimes it just stucks.

> Sometimes - less frequent in more current coreboot versions - when having such a big update the CPUs stop using the max speed (around 3491 MHz) and are stuck at a much lower speed. (I think it was around 2 GHz). All cores are still working 100% but the CPU power reduced, resulting in drastically longer compile times.

> Two suggestions.
> 1. CPU is throttling because the temperature is too high. Not likely.

Correct. I'm 100% sure it's not that. (Had that in the past and it DID cause log entries.)

> 1. I know how to reproduce a similar frequency drop, just put lower power adapter, not this huge 170W brick that comes with W530, but for example 90W one or 65W one. The CPU frequency will immediately drop to ~1200 MHz and the only way I know to fix this is to perform suspend/resume or reboot. But sometimes this happens to my W530 with original 170W brick, just as you say, maybe once in two months or so. I just didn't really bother debugging this.

Some months ago I was wondering if I had to flash back to the official bios. But it has gotten much less frequent and is now only a itch.
Now I'm wondering if it's not linked to the bug... Maybe we do something wrong at setup with either can crash the CPU when idle or just whatever mechanism linux uses to tell the CPU to switch the frequency. Now that's a very thin link and it may well turn out to be something unrelated. But that since I have no idea how we can debug the freeze I hope that poking at that may turn up something...

> Please post your lspci and cat /proc/cpuinfo | grep stepping output (I want to compare hardware revisions with mine). I'm collecting information about affected and non-affected machines, maybe I'll see some pattern, idk.

```
$ lspci
00:00.0 Host bridge: Intel Corporation 3rd Gen Core processor DRAM Controller (rev 09)
00:01.0 PCI bridge: Intel Corporation Xeon E3-1200 v2/3rd Gen Core processor PCI Express Root Port (rev 09)
00:02.0 VGA compatible controller: Intel Corporation 3rd Gen Core processor Graphics Controller (rev 09)
00:04.0 Signal processing controller: Intel Corporation 3rd Gen Core Processor Thermal Subsystem (rev 09)
```

00:14.0 USB controller: Intel Corporation 7 Series/C210 Series Chipset Family USB xHCI Host Controller (rev 04)
00:16.0 Communication controller: Intel Corporation 7 Series/C216 Chipset Family MEI Controller #1 (rev 04)
00:19.0 Ethernet controller: Intel Corporation 82579LM Gigabit Network Connection (Lewisville) (rev 04)
00:1a.0 USB controller: Intel Corporation 7 Series/C216 Chipset Family USB Enhanced Host Controller #2 (rev 04)
00:1b.0 Audio device: Intel Corporation 7 Series/C216 Chipset Family High Definition Audio Controller (rev 04)
00:1c.0 PCI bridge: Intel Corporation 7 Series/C216 Chipset Family PCI Express Root Port 1 (rev c4)
00:1c.1 PCI bridge: Intel Corporation 7 Series/C210 Series Chipset Family PCI Express Root Port 2 (rev c4)
00:1c.2 PCI bridge: Intel Corporation 7 Series/C210 Series Chipset Family PCI Express Root Port 3 (rev c4)
00:1d.0 USB controller: Intel Corporation 7 Series/C216 Chipset Family USB Enhanced Host Controller #1 (rev 04)
00:1f.0 ISA bridge: Intel Corporation QM77 Express Chipset LPC Controller (rev 04)
00:1f.2 SATA controller: Intel Corporation 7 Series Chipset Family 6-port SATA Controller [AHCI mode] (rev 04)
00:1f.3 SMBus: Intel Corporation 7 Series/C216 Chipset Family SMBus Controller (rev 04)
01:00.0 VGA compatible controller: NVIDIA Corporation GK107GLM [Quadro K2000M] (rev a1)
01:00.1 Audio device: NVIDIA Corporation GK107 HDMI Audio Controller (rev ff)
02:00.0 SD Host controller: Ricoh Co Ltd PCIe SDXC/MMC Host Controller (rev 08)
02:00.3 FireWire (IEEE 1394): Ricoh Co Ltd R5C832 PCIe IEEE 1394 Controller (rev 04)
03:00.0 Network controller: Intel Corporation Centrino Ultimate-N 6300 (rev 3e)

I'm mainly running the OS on a msata card but also have two HDDs installed. (Both normally powered but unused.)

```
$ cat /proc/cpuinfo | grep stepping
stepping        : 9
stepping        : 9
stepping        : 9
stepping        : 9
stepping        : 9
stepping        : 9
stepping        : 9
stepping        : 9
```

#42 - 09/01/2019 09:51 PM - Evgeny Zinoviev

Thanks. All revisions are the same as on my machine :(

Did you try limiting C-States? People say it helps (earlier in this topic). Might be worth checking.
Didn't help mine X220 though. I made sure that current driver is intel_idle and it crashed after a couple of hours as usual with intel_idle.max_cstate=3.

#43 - 09/03/2019 05:09 PM - Ryan Heyser

Evgeny Zinoviev wrote:

Thanks. All revisions are the same as on my machine :(

Did you try limiting C-States? People say it helps (earlier in this topic). Might be worth checking.
Didn't help mine X220 though. I made sure that current driver is intel_idle and it crashed after a couple of hours as usual with intel_idle.max_cstate=3.

It doesn't help my T420. I've had, although a significant drop in crashes, still a few after limiting cstates with the same stepping as above. To note, I have a model with a discrete GPU.

#44 - 09/22/2019 03:20 PM - Alexander Wetzel

Evgeny Zinoviev wrote:

> Did you try limiting C-States? People say it helps (earlier in this topic). Might be worth checking.
> Didn't help mine X220 though. I made sure that current driver is intel_idle and it crashed after a couple of hours as usual with intel_idle.max_cstate=3.

I think my freezes were cause by something else...
As mentioned my freezes seem to by linked to physical movements of the device. Now I left the wires soldered to the debug connector in the system, so I just have to remove the keyboard and connect them to the flasher to restore the system of a potential brick. After you reported no problems with your W530 I placed these wires slightly different: And since that I had no new freeze. (I did not set any cstate kernel parameter.)
Of course it could also be linked to something in linux 5.3 kernel but that seems to be less likely. (I'm closely tracking the wireless git kernel and the last freeze was already with the kernel 5.3.0-rc6-wt).

I report back if the freezes come back, but it looks like my report here should be ignored for tracking down the bug handled here.

#45 - 12/24/2019 06:08 AM - Andrey A.

Same problem with T420 on IvyBridge CPU (i5-3380m). Random rear hard freeze and nothing in log (Debian testing).

#46 - 12/26/2019 09:10 PM - Martin Zwicknagl

Hello,

I can report, that I had NO freezes for a month now.

During a RAM upgrade to 16GB I have replaced one 2GB Samsung SODIMM (2GB 1Rx8 PC3-10600s-09-10-ZZZ, M471B5773CHS-CH9 1149) with a SODIMM [Crucial CT102464BF160B 8GB Speicher (DDR3L, 1600 MT/s, PC3L-12800, SODIMM, 204-Pin)].
The laptop is now using two identical Crucial SODIMMs.

The problem is gone. I do not need any intel_idle.max_cstate tricks anymore. My T520 is using all cores, hyperthreading, all cstates (and turbo boost).

I think ticket 178 is also solved. Who can close 178?

Cheeers
Martin

#47 - 12/26/2019 09:33 PM - Evgeny Zinoviev

That's very good! I have many ThinkPads though, some of them are affected and some are not, and using DIMM sticks from unaffected units in affected ones doesn't help them, but that might just mean that I don't have the right DIMMs.

> I think ticket 178 is also solved. Who can close 178?

Closed it for you.

#48 - 02/13/2020 02:45 PM - Andrey Korolyov

Could please anyone still experiencing this issue confirm that it continuing to appear under following conditions:
- intel_pstate driver is either not compiled in or disabled via intel_pstate=off kernel commandline option,
- the CPU governor is not set to powersave for acpi-cpufreq interface,
- C-States are not limited by commandline option like one from above, e.g. deep C-States are available for the system.

EDIT: worksforme after disabling deep sleep states for the i915 via enable_rc6=0, the P-State/C-State settings seems to prevent this exact problem to appear in some indirect way, at this moment accumulated uptime with 4.11-ish branch equals to five days without a single freeze, hope that this issue is the same as at the beginning of this topic

#49 - 06/16/2020 12:03 AM - Evgeny Zinoviev

Andrey Korolyov wrote:

> EDIT: worksforme after disabling deep sleep states for the i915 via enable_rc6=0, the P-State/C-State settings seems to prevent this exact problem to appear in some indirect way, at this moment accumulated uptime with 4.11-ish branch equals to five days without a single freeze, hope that this issue is the same as at the beginning of this topic

So I did a little digging and I see that enable_rc6=0 option was removed in https://patchwork.kernel.org/patch/10027945/. I just tested 5.7 kernel on x220 with fresh coreboot and with Lenovo BIOS and I see that GEN6_RC_CONTROL register (0xa090) is set to the same value of 0x88060000 in both cases, which means that RC6 (bit 18) and even RC6p (bit 17) is enabled. This value is set by kernel (coreboot sets it to 0x88040000, which enables RC6 but not RC6p).

I cannot confirm nor deny yet that it keeps crashing only with coreboot and not with Lenovo BIOS, but, I guess, if the RC6 is the real cause, then there should be reports of non-coreboot x220 (or other machines like t420) users that recent kernels are crashing.

#50 - 06/16/2020 12:06 AM - Evgeny Zinoviev

Oh and by the way I also tried 4.4 kernel with Lenovo BIOS and 0xa090 was 0x88040000, which means only RC6 is enabled but not RC6p.

#51 - 06/16/2020 12:20 AM - Evgeny Zinoviev

Okay, it just crashed (with coreboot). So I patched the kernel to disable rc6p for gen6 (GEN6_FEATURES in i915_pci.c), let's see if it helps. If not, then I'll patch it again to also disable rc6 and try again.

#52 - 06/22/2020 11:45 AM - Evgeny Zinoviev

Everyone who's still suffering from this bug is suggested to apply and try out these patches:

https://review.coreboot.org/c/coreboot/+/42410
https://review.coreboot.org/c/coreboot/+/42447
https://review.coreboot.org/c/coreboot/+/42450
https://review.coreboot.org/c/coreboot/+/42455

#53 - 06/24/2020 01:18 PM - Evgeny Zinoviev

Evgeny Zinoviev wrote:

> Everyone who's still suffering from this bug is suggested to apply and try out these patches:
>
> https://review.coreboot.org/c/coreboot/+/42410
> https://review.coreboot.org/c/coreboot/+/42447
> https://review.coreboot.org/c/coreboot/+/42450
> https://review.coreboot.org/c/coreboot/+/42455

5 days no crashes with these patches on X220.

#54 - 06/25/2020 09:19 PM - Sebastian Band

Evgeny Zinoviev wrote:

> Evgeny Zinoviev wrote:
>
>> Everyone who's still suffering from this bug is suggested to apply and try out these patches:
>>
>> https://review.coreboot.org/c/coreboot/+/42410
>> https://review.coreboot.org/c/coreboot/+/42447
>> https://review.coreboot.org/c/coreboot/+/42450
>> https://review.coreboot.org/c/coreboot/+/42455
>
> 5 days no crashes with these patches on X220.

Could you please be so kind to post your config? I applied all the patches but my x220 still freezes quite regular using coreboot under idle conditions. Lenovo Bios runs fine for several days. I tried different RAM setups (different vendors and singel channel vs. dual channel setups) and the news kernel 5.7, no success so far.

#55 - 07/04/2020 09:28 PM - Evgeny Zinoviev

Sebastian Band wrote:

> Evgeny Zinoviev wrote:
>
>> Evgeny Zinoviev wrote:
>>
>>> Everyone who's still suffering from this bug is suggested to apply and try out these patches:
>>>
>>> https://review.coreboot.org/c/coreboot/+/42410
>>> https://review.coreboot.org/c/coreboot/+/42447
>>> https://review.coreboot.org/c/coreboot/+/42450
>>> https://review.coreboot.org/c/coreboot/+/42455
>>
>> 5 days no crashes with these patches on X220.
>
> Could you please be so kind to post your config? I applied all the patches but my x220 still freezes quite regular using coreboot under idle conditions.
> Lenovo Bios runs fine for several days. I tried different RAM setups (different vendors and singel channel vs. dual channel setups) and the news kernel 5.7, no success so far.

I'll post when I can, but my config is really just the defaults plus enabled usbdebug, so nothing special.

Have you tried disabling RC6 in coreboot config with these patches?

#56 - 07/05/2020 01:39 PM - Sebastian Band

Evgeny Zinoviev wrote:

> Sebastian Band wrote:
>
> > Evgeny Zinoviev wrote:
> >
> > > Evgeny Zinoviev wrote:
> > >
> > > > Everyone who's still suffering from this bug is suggested to apply and try out these patches:
> > > >
> > > > https://review.coreboot.org/c/coreboot/+/42410
> > > > https://review.coreboot.org/c/coreboot/+/42447
> > > > https://review.coreboot.org/c/coreboot/+/42450
> > > > https://review.coreboot.org/c/coreboot/+/42455
> > >
> > > 5 days no crashes with these patches on X220.
> >
> > Could you please be so kind to post your config? I applied all the patches but my x220 still freezes quite regular using coreboot under idle conditions.
> > Lenovo Bios runs fine for several days. I tried different RAM setups (different vendors and singel channel vs. dual channel setups) and the news kernel 5.7, no success so far.
>
> I'll post when I can, but my config is really just the defaults plus enabled usbdebug, so nothing special.
>
> Have you tried disabling RC6 in coreboot config with these patches?

Yes, I tried with enabled / disabled RC6 and RC6p, not much difference. Could it be related to the vgabios blob? With included vgabios the crash sometimes occurred earlier. But I've not found a setup that lead to a stable machine. Have you still patched the linux kernel?

#57 - 07/05/2020 01:45 PM - Evgeny Zinoviev

> Could it be related to the vgabios blob?

I don't know, unlikely...

> Have you still patched the linux kernel?

Nope, I reverted my patches and 5.7 runs just fine on my X220 with RC6 enabled. But since another person said that disabling RC6 helped them to get rid of crashes, I'd suggest you to try to patch the kernel as well (look for GEN6_FEATURES in i915_pci.c) to disable it permanently. If it will not help, at least we'll rule this out.

#58 - 07/11/2020 03:22 PM - Sebastian Band

I tried a default configuration beside the ME, ethernet and description blobs from the lenovo bios, and this coreboot image was really stable. I played around with different configurations and the crashes seem to be related to CONFIG_USE_OPTION_TABLE. When this option is set, my x220 freezes over night :(.
Let me know if I can help any further.
Thank you for your help.

#59 - 07/12/2020 02:22 AM - Evgeny Zinoviev

Sebastian Band wrote:

> I tried a default configuration beside the ME, ethernet and description blobs from the lenovo bios, and this coreboot image was really stable. I
> played around with different configurations and the crashes seem to be related to CONFIG_USE_OPTION_TABLE. When this option is set, my
> x220 freezes over night :(.
> Let me know if I can help any further.
> Thank you for your help.

Hm, how much sure are you that this relation with the CMOS support isn't just a coincidence?

#60 - 07/17/2020 08:36 PM - Sebastian Band

6 days ago, when I made the post I would have said about 60% sure: without CONFIG_USE_OPTION_TABLE I had an uptime of 1.5-2 days twice, as soon as I enabled CMOS settings, the laptop froze after about 6-7h.
In the meantime changed RAM to 2x4Gb SAMSUNG and I made a git update. After that the laptop was up 2 days without CONFIG_USE_OPTION_TABLE. For the last 1.5 days the laptop was running fine with CONFIG_USE_OPTION_TABLE enabled.
I'll enable my previous settings one by one, and give an update, if I can identify the cause of my problems, but maybe the RAM update did the trick.
Any idea if it will be safe to enable intel_pstate in the near future?

#61 - 08/04/2020 01:55 PM - Sebastian Band

Sorry it took me some time. After testing different configurations (with and without the above mentioned patches / default settings / adjustments I thought might help) compiled Linux with modified i915_pci.c, set cpu_scaling_governor to performance switching to a different RAM vendor I was not able to get a really stable system. The system freezes after about 3h to 2d. I was even able to get my hands on a second x220, no success. For a friend I installed coreboot on his old x230, and it is really stable.
Any tips, ideas or suggestions?

Maybe I'll try intel_idle.max_cstate=2 again.

#62 - 09/30/2020 04:34 AM - Zak Brighton Knight

I recently installed Coreboot plus SeaBIOS on my T520 Ivy Bridge and I have been having similar issues. The crashes happen exceptionally more often when I am using VMs or if I am docked in the ThinkPad dock. I managed to stop the crashes (so far) by passing the intel_idle.max_cstate=3 kernel parameter. However, I want a better solution and so I am posting here to see if anyone has worked out the issue. I am happy to test patches and provide information to help progress this issue.

#63 - 10/14/2020 12:37 AM - Viktor V

Viktor V wrote:

> Evgeny Zinoviev wrote:
>
>> Recent observations on X220.
>>
>> Using most recent CPU microcode doesn't help.
>> Not using CPU microcode at all doesn't help.
>> Disabling HT with patch #29669 doesn't help.
>> Using mrc.bin instead of native raminit doesn't help.
>> Changing DIMMs doesn't help.
>> Using stock or neutered ME doesn't help.
>>
>> Using OEM BIOS helps, of course, but that's not a solution.
>
> I have exactly the same problem, my X220 randomly hangs with that weird glitch in the left side of the screen. My build settings are pretty much defaults with SeaBIOS and Intel ME disabled.
>
> Using Debian with 2x4 Gb RAM and i5-2520M CPU.
>
> By the way, I'm also from Russia. :)

Brief update:

I've updated Coreboot on my X220 to 4.12 and the issue is still present.

With these kernel parameters Laptop hangs randomly in 2-5 hours of basic usage, confirmed 2 times:

BOOT_IMAGE=/vmlinuz-4.19.0-11-amd64 root=/dev/mapper/debian--vg-root ro quiet intel_iommu=on

With these parameters there are no hangs, Laptop works stable:

BOOT_IMAGE=/vmlinuz-4.19.0-11-amd64 root=/dev/mapper/debian--vg-root ro quiet intel_iommu=on intel_idle.max_cstate=0 processor.max_cstate=1

#64 - 11/02/2020 02:51 AM - Zak Brighton Knight

I recently installed Coreboot plus SeaBIOS on my T520 Ivy Bridge and I have been having similar issues. The crashes happen exceptionally more often when I am using VMs or if I am docked in the ThinkPad dock. I managed to stop the crashes (so far) by passing the intel_idle.max_cstate=3 kernel parameter. However, I want a better solution and so I am posting here to see if anyone has worked out the issue. I am happy to test patches and provide information to help progress this issue.

As an update to the above, intel_idle.max_cstate=3 was not stable but intel_idle.max_cstate=2 was and I haven't had any crashes in about a month.

I think it's fairly clear from reading through these issues that a fix is limiting intel_idle.max_cstate to 2 or below. If someone know what parts of coreboot interacts with the kernel code relevant for this kernel parameter I am happy to start looking into what is the underlying issue of these crashes.

#65 - 11/22/2020 06:11 PM - Sebastian Band

Using version 4.12-4147-gfd9a8b679b with the above mentioned patches (RC6p) the random freezes seem to be resolved, at least I had an uptime of 1.5 days with my patched kernel, using voidlinux default kernel I have an uptime of 1.5days so far. I've not test the dock so far, once I achieve an uptime of 5days, I'll give the dock a try. I just wanted to thank you for the great work on coreboot.

I Hope this is at least a little bit helpful to someone.

BTW. I'm still using my x220 which suffered from random freezes.

Edit (17h later): Sorry I've spoken to early two freezes in the last hours :(. I'll update and give it another try

#66 - 08/02/2021 12:28 PM - Zak Brighton Knight

Has any progress been made on this? I am happy to help out testing to try and fix this

#67 - 09/04/2021 08:22 AM - Daniel Kulesz

I encountered the issue with coreboot 4.14 on a T520 (i5) as well when running a VM using kernel 5.10 on the host. Setting the kernel boot parameter

```
intel_idle.max_cstate=2
```

as suggested here seems to have helped. Yet, I will need to use the machine longer to fully confirm this.

Interestingly, I did not encounter the issue on a X220 (i7) without this parameter set even with heavy VM usage. Could it be that this is an issue that is more likely to occur on i5 cpus? Or are they just more common?

#68 - 10/05/2021 04:04 PM - David Gebski

I encountered frequent (within 12 hours) hangs on a T420s (i5-2540M) running Manjaro Linux. I was first running Devuan with OpenRC, which seemed to cause less hangs.

```
intel_idle.max_cstate=2
```

Seemed to have fixed the hangs for the last two weeks (not permanently running), but recently encountered the first hang. I also seem to have higher CPU temps now (~10 degrees more).

UPDATE: the recent first hang may have been caused by Manjaro/GNOME/mpv, as I also encountered it on my non-corebooted desktop running the same setup.

#69 - 10/20/2021 06:28 PM - Nemanja Z

Here is my experience:
T520, i7-3740QM (upgraded from i5-2520M), HD4000
Vendor: coreboot
Version: CBET4000 4.14-2082-gee760b4be8
Release Date: 09/30/2021
RAM: 2x4GB DDR3 1333 (Rendition/Crucial RM51264BC1339.16)

Using SeaBIOS + Sandy and IvyBridge VGA Bios, standard config for these machines otherwise.
I experienced the first freeze in Windows10 after leaving the machine unattended for about 2 hours.
The fan was running, leds were on but the display was black, laptop not responding.
The same thing happened in Debian11, after a day of moderate usage without any problems I again left the machine unattended for at least 2 hours and found it unresponsive.
So the issue seems to be the C7 state which I then disabled and had no problems after that.

C States for these cpus:
C1 – Auto Halt
C1E – Auto halt, low frequency, low voltage
C3 – L1/L2 caches flush, clocks off
C6 – Save core states before shutdown and PLL off
C7 – C6 + LLC may be flushed

After setting the max state to 4:

```
root@t520:~# cat /sys/module/intel_idle/parameters/max_cstate
4

root@t520:~# grep . /sys/devices/system/cpu/cpu0/cpuidle/state*/name
/sys/devices/system/cpu/cpu0/cpuidle/state0/name:POLL
/sys/devices/system/cpu/cpu0/cpuidle/state1/name:C1
/sys/devices/system/cpu/cpu0/cpuidle/state2/name:C1E
/sys/devices/system/cpu/cpu0/cpuidle/state3/name:C3
/sys/devices/system/cpu/cpu0/cpuidle/state4/name:C6
```

I left the machine unused for 4-5 hours and the display fired up as soon as I moved the mouse again. (I don't use sleep, just display off, at least on power)
I have still to measure the power consumption difference when disabling cstate=5 but it can't be that much worse I guess.
Because of this thread I almost gave up flashing my T520 but then it also helped me a lot.
So I am overall very happy with coreboot.

Files

config	20.7 KB	06/09/2017	Julz Buckton
dmesg.txt	57.3 KB	06/09/2017	Julz Buckton
cbmem-raminit.txt	62 KB	06/29/2017	Julz Buckton
lspci.txt	29.6 KB	06/29/2019	Viktor V
cpuinfo.txt	3.94 KB	06/29/2019	Viktor V