
Subject: Re: Waster CPU Cycles when tracking @ 44.1/48k?

Posted by [Aaron Allen](#) on Tue, 27 Nov 2007 05:01:42 GMT

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How do they verify this information as correct?

AA

"LaMont" <jjdpro@gmail.com> wrote in message news:474ba231\$1@linux...

>

> Guys, I just read (Sound on Sound DEC 07) that those of us who track @
> 44.1

> & 48k are actually using "More" CPU cycles than those who track & Mix at
> 88.2/96/192..WOW!!

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> Meaning (If I'm getting this right) The computer works Harder to track and
> mix sessions at those low rates (44.1/48k)..

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> If this is corrext, then starting fresh in 08(after this last mixing
> session)

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> Since hard driver are going for very little theses days (500 gig seagate
> ATA 3.0 \$99.00 bucks everywhere, this makes going to the higher rates a
> must..

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> Please (all) chime in..DJ, Neil, Thad, John,Chris, Bill, Kim, Don, Sarah,
> Chuck, Doug W etc..

Subject: Re: Waster CPU Cycles when tracking @ 44.1/48k?

Posted by [DJ](#) on Tue, 27 Nov 2007 05:09:13 GMT

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I doubt this. The HD is having to stream twice the data. How could this be less resource intensive?

"LaMont" <jjdpro@gmail.com> wrote in message news:474ba231\$1@linux...

>

> Guys, I just read (Sound on Sound DEC 07) that those of us who track @
> 44.1

> & 48k are actually using "More" CPU cycles than those who track & Mix at
> 88.2/96/192..WOW!!

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Subject: OT: Waster CPU Cycles when tracking @ 44.1/48k?

Posted by [LaMontt](#) on Tue, 27 Nov 2007 05:50:57 GMT

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& 48k are actually using "More" CPU cycles than those who track & Mix at
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Since hard driver are going for very little theses days (500 gig seagate
ATA 3.0 \$99.00 bucks everywhere, this makes going to the higher rates a must..

Please (all) chime in..DJ, Neil, Thad, John,Chris, Bill, Kim, Don, Sarah,
Chuck, Doug W etc..

Subject: Re: OT: Wasted CPU Cycles when tracking @ 44.1/48k?

Posted by [LaMontt](#) on Tue, 27 Nov 2007 05:52:02 GMT

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Sorry

>
>Guys, I just read (Sound on Sound DEC 07) that those of us who track @
44.1
>& 48k are actually using "More" CPU cycles than those who track & Mix at
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Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?
Posted by [Kim](#) on Tue, 27 Nov 2007 07:59:47 GMT
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The only logical support I can see for this idea would be something to do with data flow and bus size depending on the app (but it's a stretch). Kinda like 64 bit computers are more or less just wasting the extra 32 bits much of the time.

I can't see immediately how this would work out though. One potential is that perhaps at 88.2 they ship two 24 bit packets in one hit, making a single 48 bit packet, precisely 3 x 16. Make it stereo and you're 6 x 16 or 3 x 32 which fits neatly down the bus. Of course you could do the same with 44.1 but you'd need to pack the data appropriately. Perhaps some apps don't.

Even on the wild stretch that I'm correct in this theory or something similar, I can't see how you'd end up using LESS. You would use less than double, sure, but not less overall.

They may be right, but I'm not a believer yet.

Cheers,
Kim.

"LaMont" <jjdpro@gmail.com> wrote:

>
>Guys, I just read (Sound on Sound DEC 07) that those of us who track @
44.1
>& 48k are actually using "More" CPU cycles than those who track & Mix at
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Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?

Posted by [DJ](#) on Tue, 27 Nov 2007 09:21:13 GMT

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"Kim" <hiddensounds@hotmail.com> wrote in message news:474bc063\$1@linux...

>

>

> The only logical support I can see for this idea would be something to do
> with data flow and bus size depending on the app (but it's a stretch).

> Kinda

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> that perhaps at 88.2 they ship two 24 bit packets in one hit, making a
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> similar,

> I can't see how you'd end up using LESS. You would use less than double,

> sure, but not less overall.

>

> They may be right, but I'm not a believer yet.

>

> Cheers,

> Kim.

Perhaps so, but we're talking about overall system resource use at 88.2 as well. You certainly don't get additional capabilities to run plugins, for instance, and when using dedicated DSP cards like the UAD-1, system resources are half what's available at 44.1. I'm going to have to get this issue and read the article. SOS is usually pretty on top of things when it comes to accuracy in their articles. This sounds to me like a big FU as far as taking the overall big picture into account.

Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?
Posted by [Kim](#) on Tue, 27 Nov 2007 11:06:08 GMT
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Well yes you're dead right. Even in the scenario I described we're talking about a "less than double" scenario, not a "less than status quo" situation. Like you say, hardware based stuff will pretty much always use precisely double the resources. Indeed I recall some sketch ideas one of the experts (chuck maybe?) put forward about the highly unlikely possibility of running a Paris system at 88.2 and that, with EDS at least, you could probably program it to simply process double the stuff, but you'd end up with half the tracks... ignoring fundamentals like changing the converters etc.

And effects calculations for double the frequency are not like, say, increasing from 24 bit to 48 bit audio. With 88.2 you literally simply have twice as many numbers rather than numbers twice as big. Sometimes numbers twice as big can be pushed through more efficiently, especially if you're on 64 bit hardware, but if you've got twice as many numbers it pretty much just takes twice as many cycles.

It's fairly much identical in every respect to trying to play a 44.1 project twice as quickly on your DAW. It seems pretty clear that it will just take twice as much grunt.

I'll be interested to hear more details. It does seem that either there is a FU of some sort, or that there is some missing info here. It wouldn't surprise me if there are hidden efficiencies somewhere, but I'd be amazingly surprised if you used less grunt overall. Bamboozled in fact. ;o)

Cheers,
Kim.

>Perhaps so, but we're talking about overall system resource use at 88.2
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>well. You certainly don't get additional capabilities to run plugins, for

>instance, and when using dedicated DSP cards like the UAD-1, system
>resources are half what's available at 44.1. I'm going to have to get this

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Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?
Posted by [Kim](#) on Tue, 27 Nov 2007 11:48:44 GMT
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Having said all that...

I do believe noting somewhere that they included a function with 64 bit processors whereby they can actually act as two 32 bit processors working in parallel. I think it required that the exact same operation was being performed in each half, but this would appear to apply in audio. If you were able to use that particular feature of the processor within a 64 bit OS (which I'm not sure about) you just MIGHT almost break even... ignoring UAD scenarios etc, but on the host only side, you should theoretically come close. The host app would obviously need to be written specifically to do this on 64 bit hardware, but it may be a possibility.

You still wouldn't use less of course, but you might only use, say, 5-10% more grunt than otherwise given that memory bandwidth is also 64 bit. Your only real bottleneck would be HDD access and, well, any other parts of the DAW software which couldn't use this feature but still had to deal with the extra data. I could envisage this might be minimal though.

So I could see that maybe, on 64 bit hardware with specifically written host software to suit, you may come close to the same performance as 44.1...

....maybe...

....did I say maybe?

Best I can come up with. Anybody else?

Cheers,
Kim.

"Kim" <hiddenounds@hotmail.com> wrote:

>

>

>Well yes you're dead right. Even in the scenario I described we're talking
>about a "less than double" scenario, not a "less than status quo" situation.
>Like you say, hardware based stuff will pretty much always use precisely
>double the resources. Indeed I recall some sketch ideas one of the experts
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Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?
Posted by [Dedric Terry](#) on Tue, 27 Nov 2007 15:09:48 GMT
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On 11/27/07 2:21 AM, in article 474be2af@linux, "DJ" <animix _ at _ animas _
dot _ net> wrote:

>
> Perhaps so, but we're talking about overall system resource use at 88.2 as
> well. You certainly don't get additional capabilities to run plugins, for
> instance, and when using dedicated DSP cards like the UAD-1, system
> resources are half what's available at 44.1. I'm going to have to get this

> issue and read the article. SOS is usually pretty on top of things when it
> comes to accuracy in their articles. This sounds to me like a big FU as far
> as taking the overall big picture into account.
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I don't know DJ, I've been seeing more and more opinionated comments and using forums as resource material in SOS reviews.

The cpu use/sample rate issue is of course easy to test and if SOS didn't even bother, then they are really getting sloppy.

Dedric

Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?
Posted by [EK Sound](#) on Tue, 27 Nov 2007 16:52:10 GMT
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BUT... the larger files are more taxing on the drive itself to stream, so you will end up with half the potential track count per drive.

David.

LaMont wrote:

> Guys, I just read (Sound on Sound DEC 07) that those of us who track @ 44.1
> & 48k are actually using "More" CPU cycles than those who track & Mix at
> 88.2/96/192..WOW!!
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> Since hard driver are going for very little theses days (500 gig seagate
> ATA 3.0 \$99.00 bucks everywhere, this makes going to the higher rates a must..
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> Please (all) chime in..DJ, Neil, Thad, John,Chris, Bill, Kim, Don, Sarah,
> Chuck, Doug W etc..

Subject: Re: OT: Wasted CPU Cycles when tracking @ 44.1/48k?
Posted by [EK Sound](#) on Tue, 27 Nov 2007 16:53:02 GMT
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You forgot to correct the speeling in the body as well... ;-)

David.

LaMont wrote:

> Sorry
>
>
>>Guys, I just read (Sound on Sound DEC 07) that those of us who track @
>
> 44.1
>
>>& 48k are actually using "More" CPU cycles than those who track & Mix at
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>

Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?
Posted by [LaMontt](#) on Tue, 27 Nov 2007 17:40:53 GMT
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Guys & Gals, I'm sorry the article was from VI (Virtual Instruments) Magazine.
I think it's the Oct/Nov 07 issue.

Dedric Terry <dterry@keyofd.net> wrote:

>On 11/27/07 2:21 AM, in article 474be2af@linux, "DJ" <animix _ at _ animas
_>
>dot _ net> wrote:
>
>>
>> Perhaps so, but we're talking about overall system resource use at 88.2
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>The cpu use/sample rate issue is of course easy to test and if SOS didn't
>even bother, then they are really getting sloppy.
>
>Dedric
>

Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?
Posted by [Neil](#) on Tue, 27 Nov 2007 17:42:56 GMT
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Based on my experience (not measurements of any kind, other than looking at the CPU meter), this is not the case. I work primarily in 88.2k, but have done perhaps 3 or 4 44.1k projects in SX, and it definitely takes more CPU horsepower to run the higher samplerates. Streaming the files is nothing for the audio drives anymore, especially if you're using SATA... I can stream around 40 tracks at 88.2k & the drive meter in SX barely registers - that's with a Western Digiblah 7,200rpm with the 8meg buffer - but the CPU absolutely takes a hit when you're using the higher samplerates. You can see it on the meter, AND you can feel it in the performance of the machine.

Neil

Dedric Terry <dterry@keyofd.net> wrote:
>On 11/27/07 2:21 AM, in article 474be2af@linux, "DJ" <animix _ at _ animas
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>Dedric
>

Subject: Re: OT: Wasted CPU Cycles when tracking @ 44.1/48k?
Posted by [LaMont](#) on Tue, 27 Nov 2007 18:24:12 GMT
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Opps, upon further review.. I mis-read the print. And it stated that If you
don't want to get half or quarter of the performance out of your DAW when
streaming samples, then work @ 44.1/48 k..
Sorry about that..Gota get a new eye glass perscription..

"LaMont" <jjdpro@gmail.com> wrote:

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>Guys, I just read (Sound on Sound DEC 07) that those of us who track @
44.1
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>Please (all) chime in..DJ, Neil, Thad, John,Chris, Bill, Kim, Don, Sarah,
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Subject: Re: OT: Wasted CPU Cycles when tracking @ 44.1/48k?

Posted by [DJ](#) on Tue, 27 Nov 2007 20:08:30 GMT

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"LaMont" <jjdpro@ameritech.net> wrote in message news:474c52bc\$1@linux...

>

> Opps, upon further review.. I mis-read the print. And it stated that If
> you
> don't want to get half or quarter of the performance out of your DAW when
> streaming samples, then work @ 44.1/48 k..
> Sorry about that..Gota get a new eye glass perscription..
>

Damn dude!!!....you had me gettin' apoplectic there for a little while.

;oD

Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?

Posted by [rick](#) on Tue, 27 Nov 2007 20:17:29 GMT

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i agree, there's definitely a hit on all aspects.

On 28 Nov 2007 03:42:56 +1000, "Neil" <OIU@OIU.com> wrote:

>

>Based on my experience (not measurements of any kind, other
>than looking at the CPU meter), this is not the case. I work
>primarily in 88.2k, but have done perhaps 3 or 4 44.1k
>projects in SX, and it definitely takes more CPU horsepower to
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>Neil

>

>
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>>Dedric
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Subject: Re: OT: Wasted CPU Cycles when tracking @ 44.1/48k?
Posted by [Chris Ludwig](#) on Tue, 27 Nov 2007 21:11:54 GMT
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Hi Lamont

I think you gonna need to clean out the bong AND get new glasses. :)
That said it sounds like some that would be passed around on the
Gearsluts forum. Hey did you know that audio sounds different playing
from a firewire than it does from a internal drive !!! NO really I can
hear the difference. But thats because of the pure silver oxygen free
firewire cables and SATA cables. :)

Chris

LaMont wrote:

> Opps, upon further review.. I mis-read the print. And it stated that If you
> don't want to get half or quarter of the performance out of your DAW when
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> Sorry about that..Gota get a new eye glass perscription..
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--

Chris Ludwig

ADK Pro Audio
(859) 635-5762
www.adkproaudio.com
chrisl@adkproaudio.com

Subject: Re: OT: Wasted CPU Cycles when tracking @ 44.1/48k?
Posted by [DJ](#) on Tue, 27 Nov 2007 21:40:11 GMT
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"Chris Ludwig" <chrisl@adkproaudio.com> wrote in message
news:474c8936\$1@linux...

> Hi Lamont
> I think you gonna need to clean out the bong AND get new glasses. :)
> That said it sounds like some that would be passed around on the Gearsluts
> forum. Hey did you know that audio sounds different playing from a
> firewire than it does from a internal drive !!! NO really I can hear the
> difference. But thats because of the pure silver oxygen free firewire
> cables and SATA cables. :)
>

> Chris

>

The thing about firewire is is noisy because you can hear the packets hitting the wall after they pop through the bus.

Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?

Posted by [TCB](#) on Wed, 28 Nov 2007 00:30:22 GMT

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INTEGER! 64 bit INTEGER PROCESSORS!!!!!! PLEASE FOR THE LOVE OF GOD DON'T MAKE ME GO OVER THIS AGAIN. FPU PROCESSING IS ALREADY 128 BIT WIDE ON MODERN PROCESSORS, AND ALMOST ALWAYS PARALLEL. SO THE FPU (IF THE ALGORITHM IS PROPERLY CODED) COULD DO TWO 64 BIT WORDS, FOUR 32 BIT WORDS, EIGHT 16 BIT WORDS, ETC. AS LONG AS IT'S THE SAME PROCESS.

INTEGER! INTEGER! INTEGER!

Sorry,

TCB

"Kim" <hiddensounds@hotmail.com> wrote:

>

>

>Having said all that...

>

>I do believe noting somewhere that they included a function with 64 bit processors

>whereby they can actually act as two 32 bit processors working in parallel.

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>each half, but this would appear to apply in audio. If you were able to use

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>software to suit, you may come close to the same performance as 44.1...
>
>...maybe...
>
>...did I say maybe?
>
>Best I can come up with. Anybody else?
>
>Cheers,
>Kim.
>
>"Kim" <hiddensounds@hotmail.com> wrote:
>>
>>
>>Well yes you're dead right. Even in the scenario I described we're talking
>>about a "less than double" scenario, not a "less than status quo" situation.
>>Like you say, hardware based stuff will pretty much always use precisely
>>double the resources. Indeed I recall some sketch ideas one of the experts
>>(chuck maybe?) put forward about the highly unlikely possibility of running
>>a Paris system at 88.2 and that, with EDS at least, you could probably
program
>>it to simply process double the stuff, but you'd end up with half the tracks...
>>ignoring fundamentals like changing the converters etc.
>>
>>And effects calculations for double the frequency are not like, say, increasing
>>from 24 bit to 48 bit audio. With 88.2 you literally simply have twice
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>>many numbers rather than numbers twice as big. Sometimes numbers twice
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>>big can be pushed through more efficiently, especially if you're on 64
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>>twice as many cycles.
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>>twice as quickly on your DAW. It seems pretty clear that it will just take
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>surprise
>>me if there are hidden efficiencies somewhere, but I'd be amazingly surprised
>>if you used less grunt overall. Bamboozled in fact. ;o)

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>>Cheers,
>>Kim.
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>>>Perhaps so, but we're talking about overall system resource use at 88.2
>>as
>>>well. You certainly don't get additional capabilities to run plugins,
for
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>>>instance, and when using dedicated DSP cards like the UAD-1, system
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>>>comes to accuracy in their articles. This sounds to me like a big FU as
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>>>as taking the overall big picture into account.
>>>
>>>
>>>
>>
>

Subject: Re: OT: Wasted CPU Cycles when tracking @ 44.1/48k?
Posted by [TCB](#) on Wed, 28 Nov 2007 00:38:17 GMT
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Why do I do I even put up with you fucking idiots? The command queuing on SCSI controllers is the only way to get even close to a pro sound. But only on U160 controllers because the disk saturates better than on the U320 ones. Trust me, the only thing that sounds anywhere near as warm and punchy as SCSI U160 is SAS fibre channel and it's even more expensive.

It's all in the command queuing, but you're all too deaf to fucking hear it.

TCB

P.S. Don't forget to make a small partition on the outer edge of the drive for your time code, and cut a small slice between it and the main data partition so the SMPTE doesn't bleed into the rest of your tracks. Now I've given away all of my secrets, and for what? You morons are all going to keep using SATA anyway . . .

"DJ" <animix _ at _ animas _ dot _ net> wrote:
>

>"Chris Ludwig" <chrisl@adkproaudio.com> wrote in message
>news:474c8936\$1@linux...
>> Hi Lamont
>> I think you gonna need to clean out the bong AND get new glasses. :)
>> That said it sounds like some that would be passed around on the Gearsluts

>> forum. Hey did you know that audio sounds different playing from a
>> firewire than it does from a internal drive !!! NO really I can hear the

>> difference. But thats because of the pure silver oxygen free firewire

>> cables and SATA cables. :)

>>

>> Chris

>>

>

>

>The thing about firewire is is noisy because you can hear the packets
>hitting the wall after they pop through the bus.

>

>

Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?

Posted by [Neil](#) on Wed, 28 Nov 2007 00:53:15 GMT

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"TCB" <nobody@ishere.com> wrote:

>

>INTEGER! 64 bit INTEGER PROCESSORS!!!!!! PLEASE FOR THE LOVE OF GOD DON'T
>MAKE ME GO OVER THIS AGAIN. FPU PROCESSING IS ALREADY 128 BIT WIDE ON
MODERN

>PROCESSORS, AND ALMOST ALWAYS PARALLEL. SO THE FPU (IF THE ALGORITHM IS
PROPERLY

>CODED) COULD DO TWO 64 BIT WORDS, FOUR 32 BIT WORDS, EIGHT 16 BIT WORDS,
>ETC. AS LONG AS IT'S THE SAME PROCESS.

>

>INTEGER! INTEGER! INTEGER!

>

>Sorry,

>

>TCB

Sooooo... they're integer processors?

:)

Subject: Re: OT: Waster CPU Cycles when tracking @ 44.1/48k?

Posted by [Kim](#) on Wed, 28 Nov 2007 01:08:00 GMT

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OK I think I've got it, but could you just go over one more time the bit after "Now listen closely..." ;o)

"TCB" <nobody@ishere.com> wrote:

>

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>ETC. AS LONG AS IT'S THE SAME PROCESS.

>

>INTEGER! INTEGER! INTEGER!

>

>Sorry,

>

>TCB

>

>"Kim" <hiddensounds@hotmail.com> wrote:

>>

>>

>>Having said all that...

>>

>>I do believe noting somewhere that they included a function with 64 bit >processors

>>whereby they can actually act as two 32 bit processors working in parallel.

>>I think it required that the exact same operation was being performed in

>>each half, but this would appear to apply in audio. If you were able to

>use

>>that particular feature of the processor within a 64 bit OS (which I'm not

>>sure about) you just MIGHT almost break even... ignoring UAD scenarios

>>etc, but on the host only side, you should theoretically come close. The

>>host app would obviously need to be written specifically to do this on

64

>>bit hardware, but it may be a possibility.

>>

>>You still wouldn't use less of course, but you might only use, say, 5-10%

>>more grunt than otherwise given that memory bandwidth is also 64 bit. Your

>>only real bottleneck would be HDD access and, well, any other parts of the

>>DAW software which couldn't use this feature but still had to deal with

>the

>>extra data. I could envisage this might be minimal though.

>>
>>So I could see that maybe, on 64 bit hardware with specifically written
>host
>>software to suit, you may come close to the same performance as 44.1...
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>>
>

Subject: Re: OT: Wasted CPU Cycles when tracking @ 44.1/48k?
Posted by [Paul Artola](#) on Wed, 28 Nov 2007 16:56:36 GMT
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I have found that mixes saved to disk-based storage sound brittle and bright. That's why I prefer using tape-based storage for a warmer and more digital saturation type sound. Digital data clipping is not pretty, but with tape, those missing bits seem to show up somehow. 9-track, baby, that's the way to go.

- Paul Artola
Ellicott City, Maryland

On 28 Nov 2007 10:38:17 +1000, "TCB" <nobody@ishere.com> wrote:

>
>Why do I do I even put up with you fucking idiots? The command queuing on
>SCSI controllers is the only way to get even close to a pro sound. But only
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>
>TCB
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>P.S. Don't forget to make a small partition on the outer edge of the drive
>for your time code, and cut a small slice between it and the main data partition
>so the SMPTE doesn't bleed into the rest of your tracks. Now I've given away
>all of my secrets, and for what? You morons are all going to keep using SATA
>anyway . . .

Subject: Re: OT: Wasted CPU Cycles when tracking @ 44.1/48k?

Posted by [DJ](#) on Wed, 28 Nov 2007 17:18:36 GMT

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My DATs are Phat, but I usually bake them to get that "warm" vibe.

"Paul Artola" <artola@comcast.net> wrote in message
news:j57rk3123h1ntqbtda14uo4cvogo2cmu59@4ax.com...

>I have found that mixes saved to disk-based storage sound brittle and
>bright. That's why I prefer using tape-based storage for a warmer and
>more digital saturation type sound. Digital data clipping is not
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Subject: Re: OT: Wasted CPU Cycles when tracking @ 44.1/48k?
Posted by [LaMontt](#) on Wed, 28 Nov 2007 20:46:26 GMT
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:)

Chris Ludwig <chrisl@adkproaudio.com> wrote:

>Hi Lamont
> I think you gonna need to clean out the bong AND get new glasses. :)
>That said it sounds like some that would be passed around on the
>Gearsluts forum. Hey did you know that audio sounds different playing
>from a firewire than it does from a internal drive !!! NO really I can
>hear the difference. But thats because of the pure silver oxygen free
>firewire cables and SATA cables. :)
>
>Chris
>
>
>
>LaMont wrote:
>> Opps, upun further review.. I mis-read the print. And it stated that If
you
>> don't want to get half or quarter of the performance out of your DAW when
>> streaming samples, then work @ 44.1/48 k..
>> Sorry about that..Gota get a new eye glass perscription..
>>
>>
>> "LaMont" <jjdpro@gmail.com> wrote:
>>> Guys, I just read (Sound on Sound DEC 07) that those of us who track
@
>> 44.1
>>> & 48k are actually using "More" CPU cycles than those who track & Mix
at
>>> 88.2/96/192..WOW!!
>>>
>>> Meaning (If I'm getting this right) The computer works Harder to track

and

>>> mix sessions at those low rates (44.1/48k)..

>>>

>>> If this is correcxt, then starting fresh in 08(after this last mixing session)

>>> , all of my session will be @ 88.2.

>>>

>>> Since hard driver are going for very little theses days (500 gig seagate

>>> ATA 3.0 \$99.00 bucks everywhere, this makes going to the higher rates

a

>> must..

>>> Please (all) chime in..DJ, Neil, Thad, John,Chris, Bill, Kim, Don, Sarah,

>>> Chuck, Doug W etc..

>>

>

>--

>Chris Ludwig

>

>ADK Pro Audio

>(859) 635-5762

>www.adkproaudio.com

>chrisl@adkproaudio.com
