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Subject: Core multithread dangers

Posted by [hojtsy](#) on Fri, 03 Feb 2006 22:09:17 GMT

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I was told before that Core & Web packages are thread-safe. But some methods of Core are not thread-safe, and something like CriticalSection::LockMain should be added to them to fix this. Here is a list of them.

```
static TimingInspector& s_zero()
TimingInspector::TimingInspector(const char *_name)
static void slnit()
String& sHomeDir()
String ConfigFile(const char *file)
byte *Alloc4KBRaw()
void *MemoryAllocPermanent(size_t size)
void *MemoryAlloc(size_t size)
void MemoryProbe(const char *name, dword flags)
const LanguageInfo& GetLanguageInfo(int lcode)
static Array<LngModule>& sMod()
CriticalSection& MainCriticalSection()
PageInfo *NewPage(int magnitude)
static CriticalSection& sHeapLock()
static CriticalSection& sHeapLock2()
static inline void slnitTables()
void MemoryInitDiagnostics()
RHITCOUNT(n)
static int sMappingGranularity_()
VectorMap<String, VectorMap<String, VectorMap<String, Topic > > >& TopicBase()
String GetIniKey(const char *name)
```

These other functions of Core need bigger rewrite to be threadsafe:sDumpPtr(void \*ptr)  
sDump(dword w)  
const char \*Dump(PageInfo \*page)  
const char \*MemoryCounters()

These functions of the Web package are not thread-safe:

```
void HttpServer::ReadPostData(Socket& socket, HttpQuery& query)
void SSLInit()
static const dword *GetCRCTable()
RefPtr<HttpQuery::Data> HttpQuery::Empty()
dword WINAPI HttpExtensionProc(EXTENSION_CONTROL_BLOCK *ecb)
```

The problem is always with the local static variables which are not protected from parallel initialization on two threads.

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Subject: Re: Core multithread dangers

Posted by [mirek](#) on Fri, 03 Feb 2006 22:51:23 GMT

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You are right in some cases, but look better. Many of those are in fact serialized elsewhere (that is esp. true for heap - that one IS thread safe to my knowledge).

OTOH, you have missed some that might cause a trouble in future (e.g. when working on GuiMT, I have found that Ptr/Pte are not really thread safe - something to fix ASAP).

Also, note that StaticCriticalSection is zero-initialized POD, so it does not perform any further form of initialization (nice simple solution to "how to serialize initialization of serializer").

Anyway, thanks. I must admit that multithreading is generally less tested / fixed than the rest of library. Any warnings/suggestions here are welcome.

Mirek

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**Subject: Re: Core multithread dangers**  
Posted by [mirek](#) on Sat, 04 Feb 2006 11:14:14 GMT  
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Well, thining about issue and going through the Core...

I have found many places where MT is broken - most of them will not affect normal apps, but anyway...

I already have MT on ToDo list, but it turns out that careful audit of sources will be needed. I hope to get it done while working on new Draw.

I am also considering another MT option for GUI - perhaps it is not that bad idea to provide single GUI critical section that would get locked while processing input events - other threads of MT GUI app would simply lock this section before calling methods of any widget.

Mirek

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**Subject: Re: Core multithread dangers**  
Posted by [hojtsy](#) on Sat, 04 Feb 2006 13:53:15 GMT  
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luzr wrote on Fri, 03 February 2006 17:51 Also, note that StaticCriticalSection is zero-initialized POD, so it does not perform any further form of initialization (nice simple solution to "how to serialize initialization of serializer"). Yes, that is a very good idea. But I needed almost an hour to figure out how that works before you posted it - it was quite tricky. Even a short code comment would have saved me lots of time.

I think this new macro is not threadsafe: #define ONCELOCK \

```
for(static volatile bool b = true; b;) \
for(static CriticalSection section; b;) \
for(CriticalSection::Lock lock(section); b; b = false)The problem is that the b flag is not protected
from repeated default-initialization to true.
```

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Subject: Re: Core multithread dangers  
Posted by [mirek](#) on Sat, 04 Feb 2006 17:20:13 GMT  
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Yes, my fault, thanks. Fixed.

Mirek

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Subject: Re: Core multithread dangers  
Posted by [mirek](#) on Mon, 06 Feb 2006 10:46:45 GMT  
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Hojtsy, I have one MT trouble I would like to share....

It is about Ptr implementation. While current version is MT safe to my knowledge, it is inferior to previous one as it allocates shared data for the lifetime of Pte target.

Original version was able to delete shared data whenever no more pointer were pointing to it, something like

```
release prec:
if(--prec->n == 0) {
    // MT!
    prec->ptr->prec = NULL;
    delete prec;
}
```

However, I do not see a way how to implement it without adding a lock to Pte, which is even worse. The trouble is that at the MT! point, Pte can be destructed and prec is not valid anymore....

(Just for record, ~Pte() { if(prec) prec->ptr = NULL; })

Hm, thinking about it, maybe single `_global_` lock would do?

Mirek

Subject: Re: Core multithread dangers  
Posted by [hojtsy](#) on Mon, 06 Feb 2006 13:18:07 GMT  
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Mirek, I did not fully understand your post. I will try to sync and see the modified implementation of Ptr, but I only have uvs set up on my home computer, so it will take some time. But my question is: how would a global lock be better than a per-object lock? Are you trying to optimize the memory consumption of the lock objects?

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Subject: Re: Core multithread dangers  
Posted by [mirek](#) on Mon, 06 Feb 2006 13:24:17 GMT  
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Yes, optimize memory. Per-object lock would add enormous data to Pte (more that would be saved by avoiding dynamic storage).

Then, "new/delete" itself have global lock and it would be called per each Pte construction/destruction without Pte global lock, so global lock for Pte does not add too much overhead IMHO. And locked areas are extremely slow (a couple of assembly instructions), which makes me believe that concurrent access will not happen very often (it is much likely to happen during new/delete).

I have tried to implement global lock version - now there are both in Core, former version commented out. Sync uvs2.

Mirek

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Subject: Re: Core multithread dangers  
Posted by [hojtsy](#) on Mon, 06 Feb 2006 13:37:31 GMT  
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OK, I will check it. In the meanwhile let me indicate a bug, which may have been corrected already. I am trying to compile an upp multithreaded application on Linux. The binary is from the 511 release, the library sources are from the latest 20060129 snapshot. Single threaded applications are compiling and running OK. But when I compile anything with the MT flag (including single threaded applications, such as the Bombs example) the application just freezes while starting. With some debugging we discovered that it seems to be waiting forever for some mutex. Is it possible that recursive locking happens for the same lock?

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Subject: Re: Core multithread dangers  
Posted by [mirek](#) on Mon, 06 Feb 2006 13:52:16 GMT  
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Definitely.

Frankly, you are perhaps the first one trying to do MT in Linux

My guess is that it is either the issue of Single or INIT\_LOCK.

Mirek

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Subject: Re: Core multithread dangers  
Posted by [mirek](#) on Mon, 06 Feb 2006 18:19:27 GMT  
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Well, indeed. Some that I missed in my education: linux mutex is not reentrant.

I have spent nice productive day fixing this issue. At least GuiMT example now seems to work.

Mirek

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Subject: Re: Core multithread dangers  
Posted by [hojtsy](#) on Tue, 07 Feb 2006 08:59:53 GMT  
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luzr wrote on Mon, 06 February 2006 13:19 I have spent nice productive day fixing this issue. At least GuiMT example now seems to work. You mean it works on Linux? Because previously it didn't even work on windows for me - but that is fixed now.

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Subject: Re: Core multithread dangers  
Posted by [fudadmin](#) on Tue, 07 Feb 2006 10:09:13 GMT  
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But I've got this error:

Linking...

LINK : fatal error LNK1104: cannot open file 'LIBCMTD.lib'

this article says something about missing LIB variables for Visual Studio .NET  
[http://www.celoxica.com/support/view\\_article.asp?ArticleID=5](http://www.celoxica.com/support/view_article.asp?ArticleID=5) 27

As I remember, when installing Ultimate++ said: "don't need to setup environment variables for MS toolkit".  
Any quick fix?

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Subject: Re: Core multithread dangers  
Posted by [unodgs](#) on Tue, 07 Feb 2006 10:41:17 GMT  
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I'm not sure but in VisualC++ toolkit multithreaded libs are missing... (try to get full visual studio..)

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Subject: Re: Core multithread dangers  
Posted by [fudadmin](#) on Tue, 07 Feb 2006 11:49:18 GMT  
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unodgs wrote on Tue, 07 February 2006 05:41 I'm not sure but in VisualC++ toolkit multithreaded libs are missing... (try to get full visual studio..)

But I've got that library...

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Subject: Re: Core multithread dangers  
Posted by [mirek](#) on Tue, 07 Feb 2006 13:42:05 GMT  
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The simple way is to download Visual Studio Express 2005. It is free (till the end of year I guess). And you even do not need to install the studio, just commandline compiler

Mirek

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