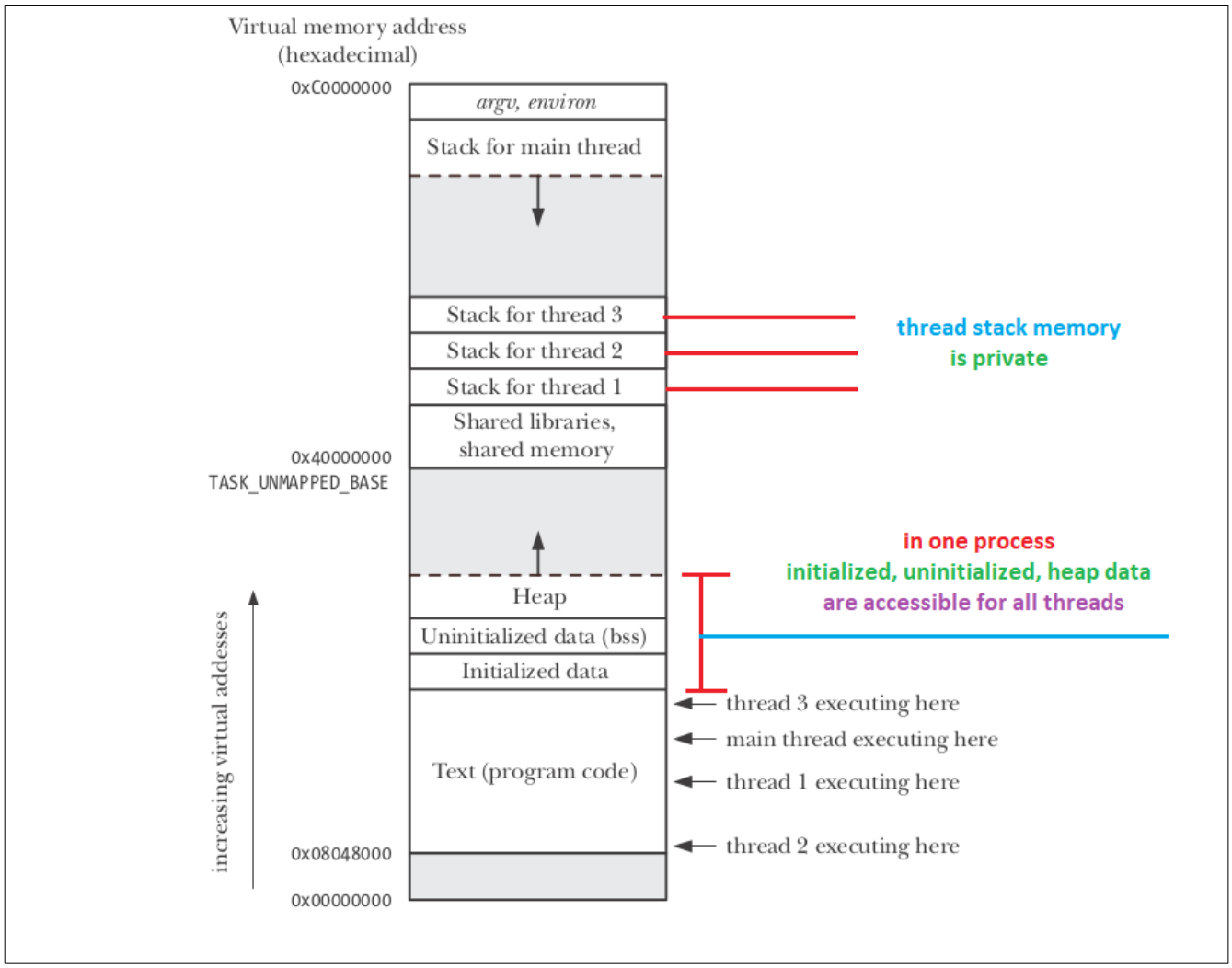
THREAD

Thread is a mechanism that permits an application to perform multiple tasks concurrently.
A process can contain multiple threads.



Memory

Stack

Stack is a portion of memory (in RAM). It grows and shinks similar to a stack data struct, things can be added and removed at the top.
When thread is created, it is allocated a stack space. If we store more information than stack capacity, we will get a stack overflow and crash.
Default thread stack size for a few architectures

i386	2	MB
x86_64	2	MB
IA-64	32	MB

PowerPC	4 MB

However, the stack size can be explicitly set in the attribute argument used to create thread by using pthread_attr_setstacksize.

Initialized Data, Uninitalized Data & Heap

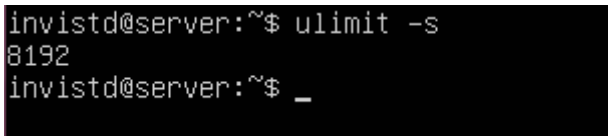
In one process, threads all share the same global memory, including:

Initalized data	*global initalized variables* *global static initalized variables* *local static initalized variables*
Uninitalized data	*global uninitalized variables* *global static uninitalized variables* *local static uninitalized variables*
Heap data	*allocated by new, malloc, calloc*

Practise

Check thread default stack size

```
ulimit -s
```



Errno

In threaded programs, each thread has its own errno value.

Reason:

- To avoid race conditions

Example

```
#include <pthread.h>
#include <stdio.h>
#include <errno.h>
#include <string.h>
#include <stdlib.h>
#include <unistd.h>

void* func_1() {
    errno = 1;
    printf("func_1, errno value: %d\n", errno);
}

void* func_2() {
```

```
    printf("func_2, errno value: %d\n", errno);
}

int main() {
    pthread_t thread_1;
    pthread_create(&thread_1, NULL, func_1, NULL);
    sleep(1);

    pthread_t thread_2;
    pthread_create(&thread_2, NULL, func_2, NULL);
    sleep(1);

    return 0;
}
```

In above program,
- thread_1 set errno to 1. However, thread_1 set its own errno instead of global errno.
- One second later, thread_2 print errno value. However, thread_2 print its own errno instead of global errno.

```
invistd@server:~/share$ gcc ./hello.c -o ./hello -pthread
invistd@server:~/share$ ./hello
func_1, errno value: 1
func_2, errno value: 0
invistd@server:~/share$
```

Return value from pthreads functions
In pthreads API, functions return 0 on success or a positive value on failure.
The returned failure value is used to replace errno.