

CSCI315 – Operating Systems Design

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Pthread Attributes

Ch 4.4-4.6

This set of notes is based on notes from the textbook authors, as well as L. Felipe Perrone, Joshua Stough, and other instructors.

Pthread programming information is also from the [tutorial](#) by Blaise Barney from Lawrence Livermore National Lab. Xiannong Meng, Fall 2021.

Thread Attributes

- A thread contains many attributes that are accessible to the programmers.
- In the pthread model, programmers can get and set attribute values through defined API
- We will discuss the how to get and set thread attributes using a few examples.
 - <http://www.eg.bucknell.edu/~cs315/F2021/meng/code/thread/trd-attr-display.c>
 - <http://www.eg.bucknell.edu/~cs315/F2021/meng/code/thread/trd-attr.c>

Pthread Attribute Values

- Pthread attribute values include, among others
 - Scheduling policy
 - Scheduling priority, relative within the same pool of threads
 - Stack size
 - Stack starting address

Thread Attribute APIs

```
void pthread_attr_init(pthread_attr_t * attrp);
```

```
/* Retrieves initial attribute values (default values) */
```

```
int pthread_attr_getschedpolicy(pthread_attr_t * attrp, int * i);
```

```
/* Retrieves schedule policy and save it to an int pointed by i */
```

```
int pthread_attr_getschedparam(pthread_attr_t * attrp,  
                               struct sched_param * sp);
```

```
/* Retrieves schedule parameters and save them to a structure pointed by sp */
```

```
int pthread_attr_getstack(pthread_attr_t * attrp,  
                          void * stkaddr, size_t * v);
```

```
/* Retrieves stack address and size and save them in respective parameters */
```

Example to Examine Attributes

```
void display_attr(pthread_attr_t attr) {
    int s, i;
    struct sched_param sp;
    size_t v;
    void *stkaddr;
    pthread_t tid = pthread_self(); // get thread ID
    printf("Attributes for thread %lu\n", tid);
    s = pthread_attr_getschedpolicy(&attr, &i); // retrieve scheduling policy into i
    printf("Scheduling policy = %s\n",          // print the string based on the value of i
           (i == SCHED_OTHER) ? "SCHED_OTHER" :
           (i == SCHED_FIFO) ? "SCHED_FIFO" :
           (i == SCHED_RR)  ? "SCHED_RR" :
           "???");
    s = pthread_attr_getschedparam(&attr, &sp); // retrieve scheduling param into sp
    printf("Scheduling priority = %d\n", sp.sched_priority); // print the priority
    s = pthread_attr_getstack(&attr, &stkaddr, &v); // retrieve stack addr and size
    printf("Stack address    = %p\n", stkaddr);
    printf("Stack size      = 0x%x bytes\n", v);
}
```

Example to Set Attributes

```
void get_show_stack(pthread_attr_t *attr) {  
  
    int s,  
    size_t v;  
    void * stkaddr;  
  
    s = pthread_getstack(attr, &stkaddr, &v);  
    printf("Stack address = %p\n", stkaddr);  
    printf("Stack size = 0x%x bytes\n", v);  
  
    v *= 2; /* double the stack size */  
    s = pthread_attr_setstack(attr, stkaddr, v); // set size of the stack  
  
    /* now get and print the updated stack size */  
    s = pthread_getstack(attr, &stkaddr, &v); // retrieve the doubled stack size into v  
    printf("Stack address = %p\n", stkaddr);  
    printf("Stack size = 0x%x bytes\n", v);  
  
}
```