192 lines (116 sloc) | 8.04 KB

Raw Blame

说明：

1. 使用中的物理页：当前使用次数不为0的物理页，状态标记为1
2. 已经被申请但未使用的物理页：当前使用次数为0，但是已经被申请出去的物理页，状态标记为2
3. 空闲物理页：当前可以被申请的物理页，状态标记为3

任务1

在pmap.c中实现函数 `int page_alloc2(struct Page **pp)`，并在pmap.h中添加该函数的声明。其功能与原有的page_alloc完全一样（你可以直接复制page_alloc的代码），唯一的区别在于，如果确实分配到了物理页面，该函数要输出分配到的物理页的信息

输出格式： `printf("page number is %x, start from pa %x\n",ppn,pa);`

其中ppn为页号，pa为该页面的起始物理地址

任务2

在pmap.c中实现函数 `void get_page_status(int pa)` 并在pmap.h中添加该函数的声明。函数输入的是一个物理地址，请按格式输出该物理页的状态信息。

输出格式： `printf("times:%d, page status:%d\n",var1,var2);`

其中var1是统计该函数被调用的次数（首次从1开始），var2是返回该物理地址对应的页面状态标记数字。 评测要求：请确保page_init初始化后page_free_list从表头到表尾物理页下标依次递减

任务3

本次课上测试会对课下测试进行加强测试，请大家在pmap.h中添加以下函数定义（请不要在pmap.c中添加这两个函数的实现，否则远端测评无法编译）：

1. `void test_queue();`
2. `void pm_check();`

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HammerVPN 2.79 | Operating-Syste... | 相关函数 | 物理内... | lab2-1.md - Typora

英 12:03 周二 2022/4/12

```
#define LIST_INSERT_TAIL(head, elm, field) do { \
                if (LIST_FIRST((head)) == NULL) {
                          \
                        LIST_FIRST((head)) = (elm);
                          \
                        (elm)->field.le_prev = &LIST_FIRST((head));
                          \
                } else {
                          \
                        for ((LIST_NEXT((elm), field)) = LIST_FIRST((head));
                         \
                                ((LIST_NEXT(LIST_NEXT((elm), field), field)) !=
NULL);                   \
                                (LIST_NEXT((elm), field)) =
LIST_NEXT(LIST_NEXT((elm), field), field));  \
                        LIST_NEXT(LIST_NEXT((elm), field), field) = (elm);
                         \
                        (elm)->field.le_prev = &LIST_NEXT(LIST_NEXT((elm),
field), field);                \
                }
                          \
                        LIST_NEXT((elm), field) = NULL;
                          \
        } while (0)


#define LIST_INSERT_AFTER(listelm, elm, field) do {
         \
                LIST_NEXT((elm), field) = LIST_NEXT((listelm), field);
          \
                if (LIST_NEXT((listelm), field) != NULL)
          \
```

```
                    LIST_NEXT((listelm), field)->field.le_prev =
&LIST_NEXT((elm), field); \
                LIST_NEXT((listelm), field) = (elm);
          \
                (elm)->field.le_prev = &LIST_NEXT((listelm), field);
          \
        } while (0)


#define LIST_INSERT_AFTER(listelm, elm, field) do { \
               LIST_NEXT((elm), field) = LIST_NEXT((listelm), field); \
               if (LIST_NEXT((listelm), field)) { \
                       LIST_NEXT((listelm), field)->field.le_prev =
&LIST_NEXT((elm), field); \
               } \
               LIST_NEXT((listelm), field) = (elm); \
               (elm)->field.le_prev = &LIST_NEXT((listelm), field); \
        }while (0)

#define LIST_INSERT_TAIL(head, elm, field) do { \
                if (LIST_FIRST((head)) != NULL) { \
                        LIST_NEXT((elm), field) = LIST_FIRST((head)); \
                        while (LIST_NEXT(LIST_NEXT((elm), field), field) !=
NULL) {  \
                            LIST_NEXT((elm), field) = LIST_NEXT(LIST_NEXT((elm),
field), field); \
                        } \
                        LIST_NEXT(LIST_NEXT((elm), field), field) = (elm); \
                        (elm)->field.le_prev = &LIST_NEXT(LIST_NEXT((elm),
field), field); \
                        LIST_NEXT((elm), field) = NULL; \
                } else { \
                    LIST_INSERT_HEAD((head), (elm), field); \
                } \
        } while (0)


void
page_init(void)
{
    /* Step 1: Initialize page_free_list. */
    LIST_INIT(&page_free_list);
    /* Hint: Use macro `LIST_INIT` defined in include/queue.h. */


    /* Step 2: Align `freemem` up to multiple of BY2PG. */
    freemem = ROUND(freemem, BY2PG);


    /* Step 3: Mark all memory blow `freemem` as used(set `pp_ref`
     * filed to 1) */
    int used_page = PADDR(freemem)/BY2PG;
    int i;
    for (i = 0; i < used_page; i++) {
        pages[i].pp_ref = 1;
    }
```

```
    /* Step 4: Mark the other memory as free. */
    for (i = used_page; i < npage; i++) {
        pages[i].pp_ref = 0;
        LIST_INSERT_HEAD(&page_free_list, &pages[i], pp_link);
    }
}
int
page_alloc(struct Page **pp)
{
    struct Page *ppage_temp;

    /* Step 1: Get a page from free memory. If fails, return the error code.*/
    if ((ppage_temp = LIST_FIRST(&page_free_list)) == NULL) {
        return -E_NO_MEM;
    }


    /* Step 2: Initialize this page.
     * Hint: use `bzero`. */
    LIST_REMOVE(ppage_temp, pp_link);
    u_long temp = page2kva(ppage_temp);
    bzero((void *)temp, BY2PG);
    *pp = ppage_temp;
    return 0;

}
void
page_free(struct Page *pp)
{
    /* Step 1: If there's still virtual address refers to this page, do nothing.
*/

    if(pp->pp_ref > 0) {
        return;
    }


    /* Step 2: If the `pp_ref` reaches to 0, mark this page as free and return.
*/
    if(pp->pp_ref == 0) {
        LIST_INSERT_HEAD(&page_free_list, pp, pp_link);
        return;
    }


    /* If the value of `pp_ref` less than 0, some error must occurred before,
     * so PANIC !!! */
    panic("cgh:pp->pp_ref is less than zero\n");
}
```

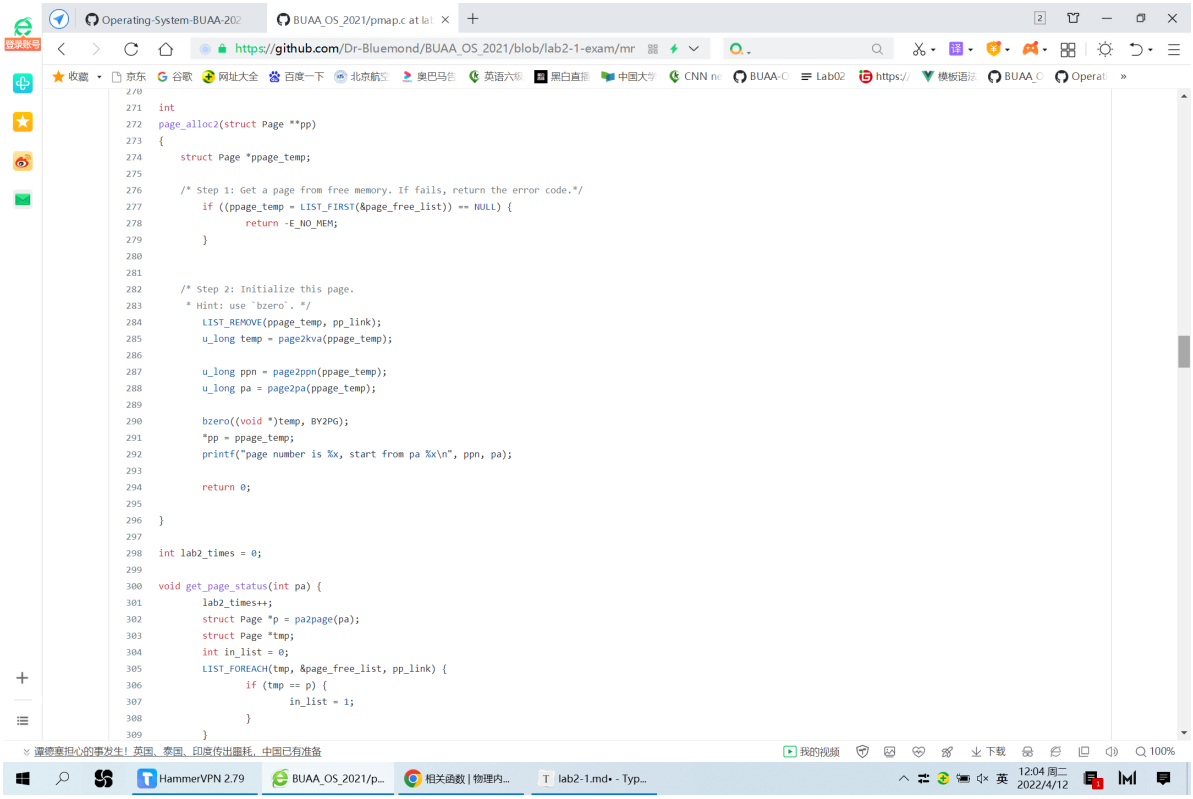
page2kva(struct Page *_pp_) 得到页pp的虚地址

page2ppn(struct Page *_pp_) 得到页pp的物理页号

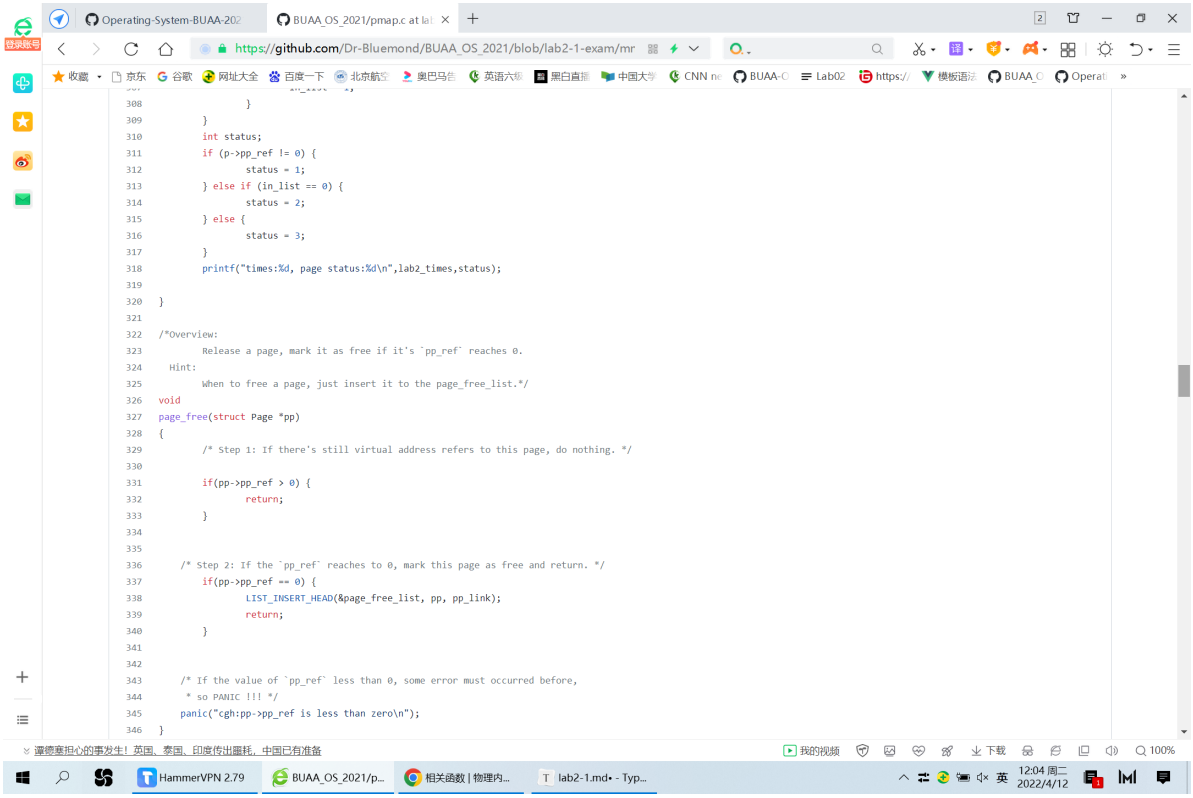
page2pa(struct Page *_pp_) 得到页pp的实地址

pa2page(u_long _pa_) 得到实地址pa的页

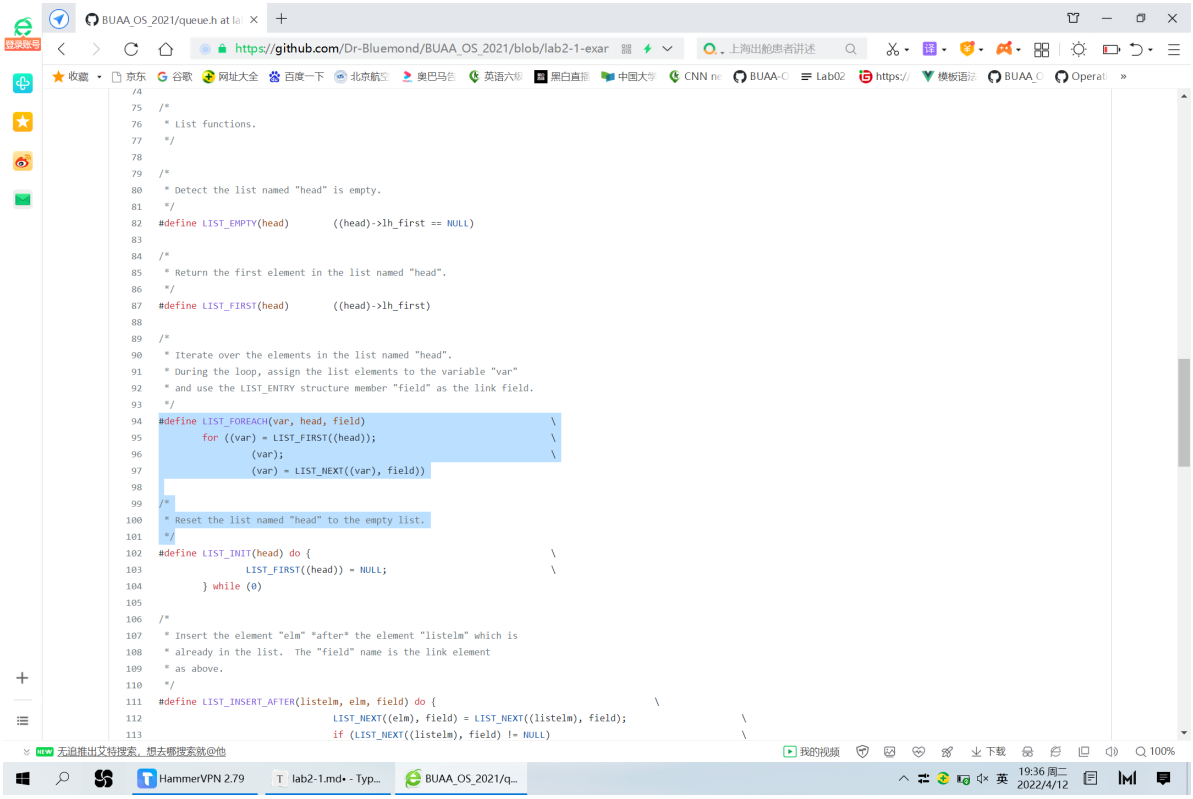
PPN(_va_) 得到实地址va的物理页号



```
int
page_alloc2(struct Page **pp)
{
    struct Page *ppage_temp;

    /* Step 1: Get a page from free memory. If fails, return the error code.*/
        if ((ppage_temp = LIST_FIRST(&page_free_list)) == NULL) {
                return -E_NO_MEM;
        }


    /* Step 2: Initialize this page.
     * Hint: use `bzero`. */
        LIST_REMOVE(ppage_temp, pp_link);
        u_long temp = page2kva(ppage_temp);

        u_long ppn = page2ppn(ppage_temp);
        u_long pa = page2pa(ppage_temp);

        bzero((void *)temp, BY2PG);
        *pp = ppage_temp;
        printf("page number is %x, start from pa %x\n", ppn, pa);

        return 0;

}

int lab2_times = 0;

void get_page_status(int pa) {
        lab2_times++;
        struct Page *p = pa2page(pa);
        struct Page *tmp;
        int in_list = 0;
        LIST_FOREACH(tmp, &page_free_list, pp_link) {
                if (tmp == p) {
                        in_list = 1;
                }
        }
```



```
                }
        }
        int status;
        if (p->pp_ref != 0) {
                status = 1;
        } else if (in_list == 0) {
                status = 2;
        } else {
                status = 3;
        }
        printf("times:%d, page status:%d\n",lab2_times,status);

}

/*Overview:
        Release a page, mark it as free if it's `pp_ref` reaches 0.
  Hint:
        When to free a page, just insert it to the page_free_list.*/
void
page_free(struct Page *pp)
{
        /* Step 1: If there's still virtual address refers to this page, do nothing. */

        if(pp->pp_ref > 0) {
                return;
        }


    /* Step 2: If the `pp_ref` reaches to 0, mark this page as free and return. */
        if(pp->pp_ref == 0) {
                LIST_INSERT_HEAD(&page_free_list, pp, pp_link);
                return;
        }


    /* If the value of `pp_ref` less than 0, some error must occurred before,
     * so PANIC !!! */
    panic("cgh:pp->pp_ref is less than zero\n");
}
```



exam

题目背景

我们实现的MOS操作系统中，所有的物理页的可能状态有三种：使用中物理页、空闲物理页、已经被申请但未被使用的物理页。

Note：page_alloc的时候只是申请了一个物理页，但是物理页没有使用，请仔细思考这三种状态物理页的判定方法。

说明：

使用中的物理页：当前使用次数不为0的物理页，状态标记为1
已经被申请但未使用的物理页：当前使用次数为0，但是已经被申请出去的物理页，状态标记为2
空闲物理页：当前可以被申请的物理页，状态标记为3

任务1

在pmap.c中实现函数int page_alloc2(struct Page **pp)，并在pmap.h中添加该函数的声明。其功能与原有的page_alloc完全一样（你可以直接复制page_alloc的代码）,唯一的区别在于，如果确实分配到了物理页面，该函数要输出分配到的物理页的信息

输出格式： printf("page number is %x, start from pa %x\n",ppn,pa);

其中ppn为页号，pa为该页面的起始物理地址

任务2

在pmap.c中实现函数 void get_page_status(int pa) 并在pmap.h中添加该函数的声明。函数输入的是一个物理地址，请按格式输出该物理页的状态信息。

输出格式： printf("times:%d, page status:%d\n",var1,var2);

其中var1是统计该函数被调用的次数（首次从1开始），var2是返回该物理地址对应的页面状态标记数字。
评测要求：请确保page_init初始化后page_free_list从表头到表尾物理页下标依次递减

任务3

本次课上测试会对课下测试进行加强测试，请大家在pmap.h中添加以下函数定义（请不要在pmap.c中添加这两个函数的实现，否则远端测评无法编译）：

```
void test_queue();
void pm_check();




int
page_alloc2(struct Page **pp)
{
    struct Page *ppage_temp;

    /* Step 1: Get a page from free memory. If fails, return the error code.*/
    if ((ppage_temp = LIST_FIRST(&page_free_list)) == NULL) {
        return -E_NO_MEM;
    }


    /* Step 2: Initialize this page.
     * Hint: use `bzero`. */
    LIST_REMOVE(ppage_temp, pp_link);
    u_long temp = page2kva(ppage_temp);

    u_long ppn = page2ppn(ppage_temp);
    u_long pa = page2pa(ppage_temp);

    bzero((void *)temp, BY2PG);
    *pp = ppage_temp;
    printf("page number is %x, start from pa %x\n", ppn, pa);

    return 0;

}

int lab2_times = 0;

void get_page_status(int pa) {
    lab2_times++;
    struct Page *p = pa2page(pa);
    struct Page *tmp;
    int in_list = 0;
    LIST_FOREACH(tmp, &page_free_list, pp_link) {
        if (tmp == p) {
            in_list = 1;
        }
    }
    int status;
    if (p->pp_ref != 0) {
        status = 1;
    } else if (in_list == 0) {
        status = 2;
    } else {
        status = 3;
    }
    printf("times:%d, page status:%d\n",lab2_times,status);

}
```

EXTRA


```
#define MAPSIZE 512
unsigned int page_bitmap[MAPSIZE];
void
page_init(void)
{
    /* Step 1: Initialize page_free_list. */
    // LIST_INIT(&page_free_list);
    /* Hint: Use macro `LIST_INIT` defined in include/queue.h. */


    /* Step 2: Align `freemem` up to multiple of BY2PG. */
    freemem = ROUND(freemem, BY2PG);


    /* Step 3: Mark all memory blow `freemem` as used(set `pp_ref`
     * filed to 1) */
    int used_page = PADDR(freemem)/BY2PG;
    int i, j;
    int im, jm;
    for (i = 0; i < MAPSIZE; i++) {
        page_bitmap[i] = 0;
    }
    im = used_page / 32;
    jm = used_page % 32;
    for (i = 0; i < im; i++) {
        page_bitmap[i] = ~0;
    }
    for (j = 0; j < jm; j++) {
```

```
        page_bitmap[im] |= (1 << j);
    }
    printf("page bitmap size is %x\n", MAPSIZE);
}


int
page_alloc(struct Page **pp)
{
    int pn;
    int i, j;
    unsigned int bits;
    for (i = 0; i < MAPSIZE; i++) {
        bits = page_bitmap[i];
        if (bits != ~0) {
            for (j = 0; j < 32; j++) {
                if ((bits & (1 << j)) == 0) {
                    bits |= (1 << j);
                    page_bitmap[i] = bits;
                    pn = i * 32 + j;
                    *pp = pages+pn;
                    return 0;
                }
            }
        }
    }

    return -E_NO_MEM;

}


void
page_free(struct Page *pp)
{
    /* Step 1: If there's still virtual address refers to this page, do nothing.
*/

    if(pp->pp_ref > 0) {
        return;
    }


    int pn = page2ppn(pp);
    int i, j;
    /* Step 2: If the `pp_ref` reaches to 0, mark this page as free and return.
*/
    if(pp->pp_ref == 0) {
        i = pn / 32;
        j = pn % 32;
        page_bitmap[i] &= ~(1 << j);
        return;
    }


    /* If the value of `pp_ref` less than 0, some error must occurred before,
     * so PANIC !!! */
    panic("cgh:pp->pp_ref is less than zero\n");
```

```
}
```