UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

MP0: Setting Up a Kernel Development Environment

CS 423: Operating System Design

Spring 2026

Important Dates

- **MP0 is released today.**
- **The due date is 2/9 11:59:59 PM CT.**
- **No late submission, even 1 second late.**

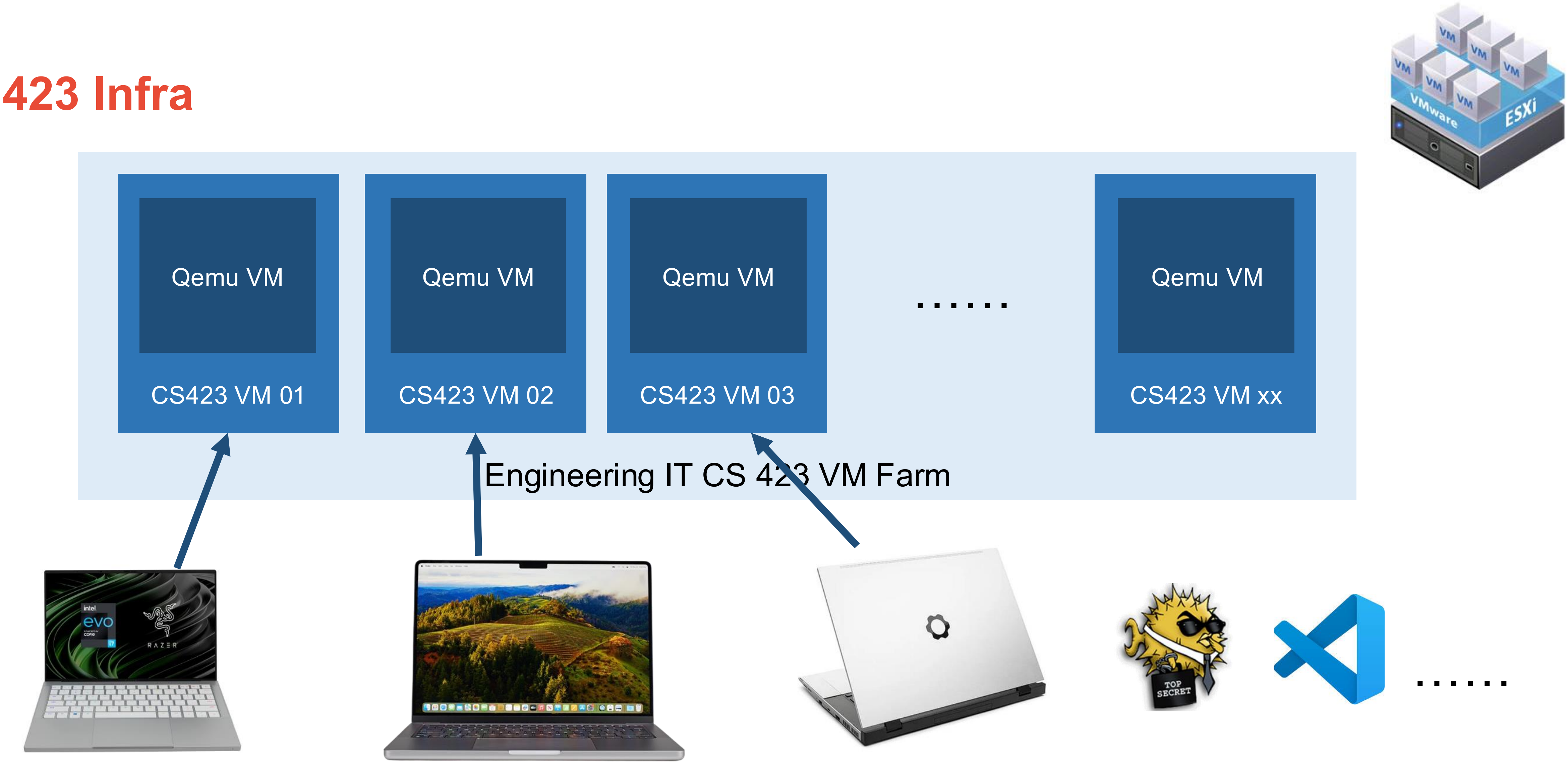
Goals

- You will configure your development environment for upcoming MPs.
- You will download, compile, and test your own kernel.
- The kernel source code will be a helpful reference.

What you need

- A Linux environment to compile your kernel and develop the MP.
- Another Linux environment to test your kernel/module.

CS 423 Infra



Qemu VM

CS423 VM 01

Qemu VM

CS423 VM 02

Qemu VM

CS423 VM 03

……

Qemu VM

CS423 VM xx

Engineering IT CS 423 VM Farm

CS 423 VM

- For your development
- Provided by EngrIT
- You must use this VM to complete the MPs
- Ubuntu 24.04, No GUI

CS 423 Qemu

- Another VM for testing your kernel/module
- Q script creates an overlayfs on your VM, modification not saved
- Crash won’t affect the host VM/your development, fast reboot
- … Yes, it is nested virtualization

Connecting to your VM

- Check your arrangement and power it ON first
- Use your favorite SSH client or tool like VSCode
- Install your public key (typing NetID password everytime?)
- We strongly recommend VSCode…

Demo

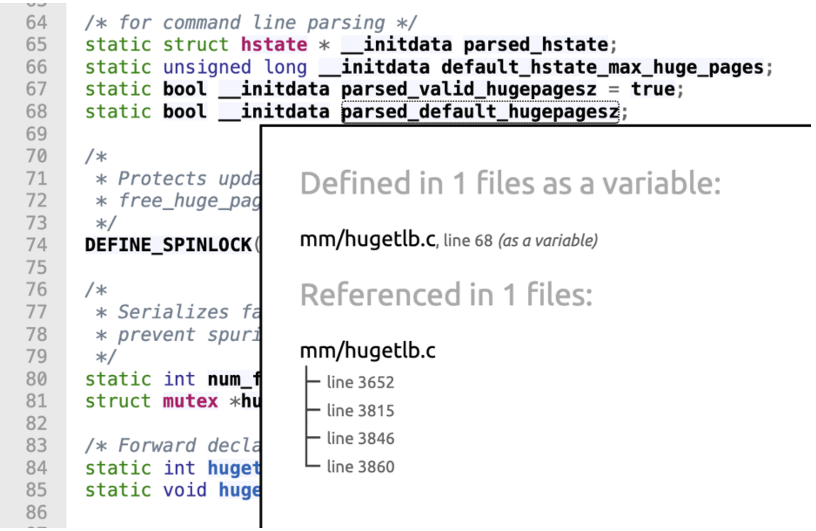
Navigating your code/kernel source

- **Bootlin Elixir (Web)**

  https://elixir.bootlin.com/linux/

- **VSCode + clangd (recommended)**

  Needs some work to make it functional



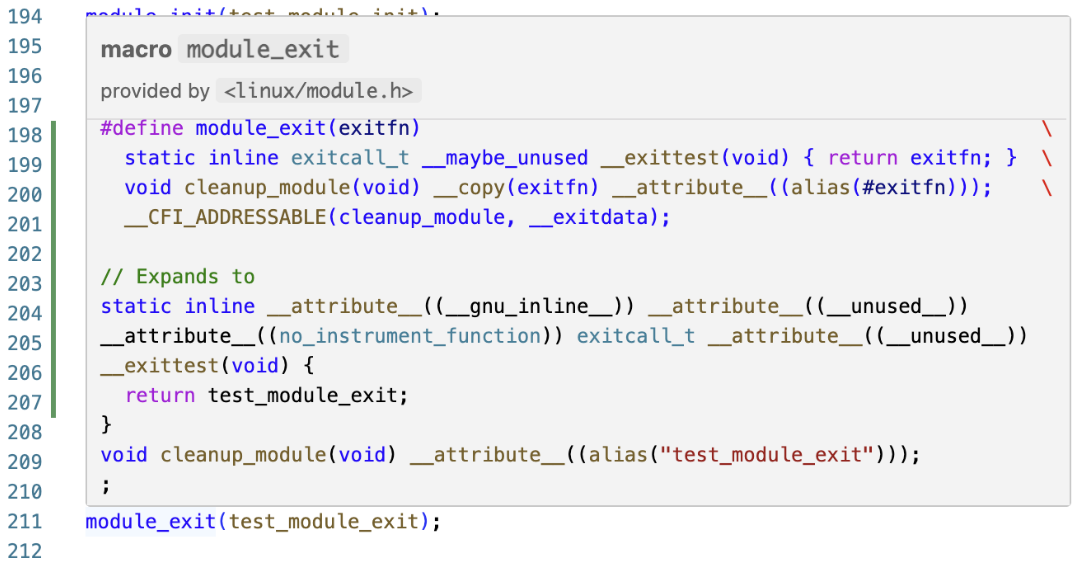
```
/* for command line parsing */
static struct hstate * __initdata parsed_hstate;
static unsigned long __initdata default_hstate_max_huge_pages;
static bool __initdata parsed_valid_hugepagesz = true;
static bool __initdata parsed_default_hugepagesz;

/*
 * Protects upda
 * free_huge_pag
 */
DEFINE_SPINLOCK(

/*
 * Serializes fa
 * prevent spuri
 */
static int num_f
struct mutex *hu

/* Forward decla
static int huget
static void huge
```

Defined in 1 files as a variable:

mm/hugetlb.c, line 68 *(as a variable)*

Referenced in 1 files:

mm/hugetlb.c
- line 3652
- line 3815
- line 3846
- line 3860



```
module_init(test_module_init);
```

macro module_exit

provided by <linux/module.h>

```
#define module_exit(exitfn)                                              \
  static inline exitcall_t __maybe_unused __exittest(void) { return exitfn; }  \
  void cleanup_module(void) __copy(exitfn) __attribute__((alias(#exitfn)));    \
  __CFI_ADDRESSABLE(cleanup_module, __exitdata);

// Expands to
static inline __attribute__((__gnu_inline__)) __attribute__((__unused__))
__attribute__((no_instrument_function)) exitcall_t __attribute__((__unused__))
__exittest(void) {
  return test_module_exit;
}
void cleanup_module(void) __attribute__((alias("test_module_exit")));
;
```

```
module_exit(test_module_exit);
```

Submission

- **Submit to Google Form (posted on the MP0 doc).**
- `dmesg | grep 'Linux version’`
- **Requires Illinois login.**
- **We will use your last submission for grading.**

Q/A