# CSE 451 Section 2
# XK Lab 1 Design

au19

## Where to start?

Start by reading:

- **lab/overview.md** - A description of the xk codebase. A MUST-READ!
- **lab/lab1.md** - Assignment write-up
- **lab/memory.md** - An overview of memory management in xk
- **lab1design.md** - A design doc for the lab 1 code
    - You will be in charge of writing design docs for the future labs. Check out lab/designdoc.md for details.

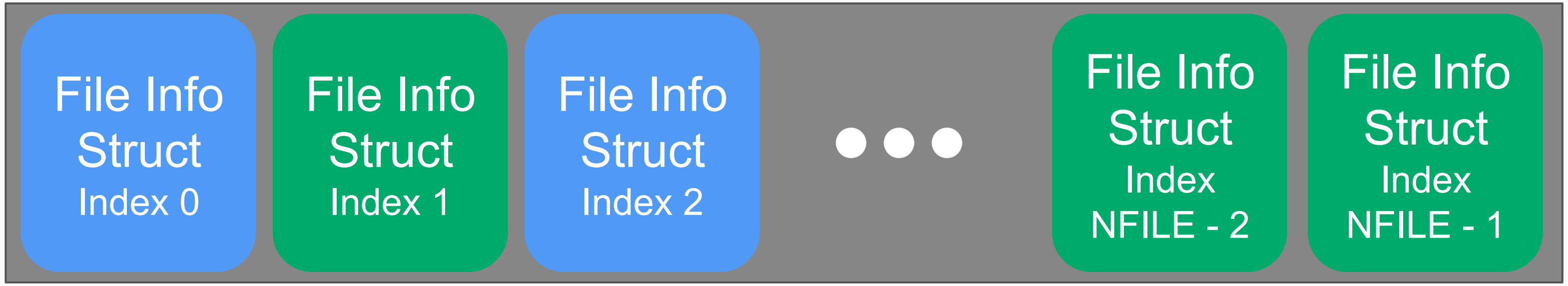
## File Information

Need a way to store the following information about a file:

- In memory reference count
- A reference to the inode of the file
- Current offset
- Access permissions (readable or writable) [for when we add pipes and file writeability later]

File Info Struct

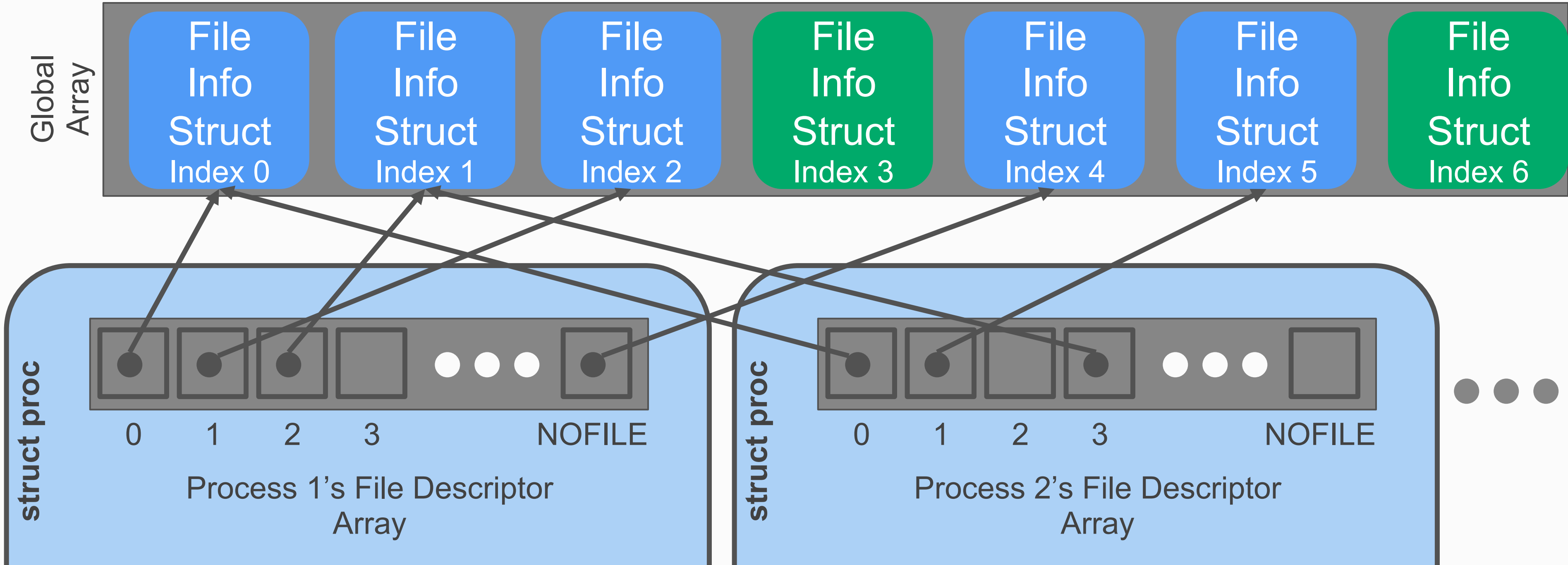
## Kernel View



🟦 = In use 🟩 = Available

There will be a global array of all the open files on the system (bounded by NFILE) placed in static memory.

# Process View



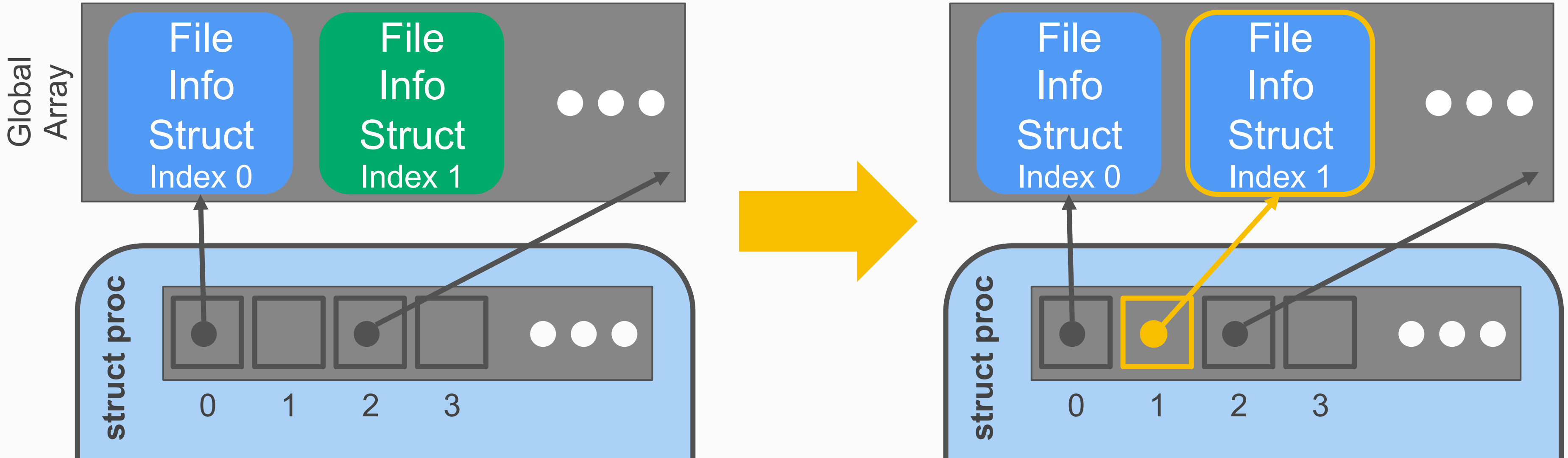
## Functions

## *filewrite* and *fileread*

- Writing or reading of a "file", based on whether the file is an inode or a pipe.
  - Note that file is in quotes. A file descriptor can represent many different things. You could be reading from a file, or you could be reading from standard in or a pipe!
- Don't need to worry about the pipe part for this lab, just the inode files.
- Check out the functions *readi* and *writei* defined in kernel/fs.c

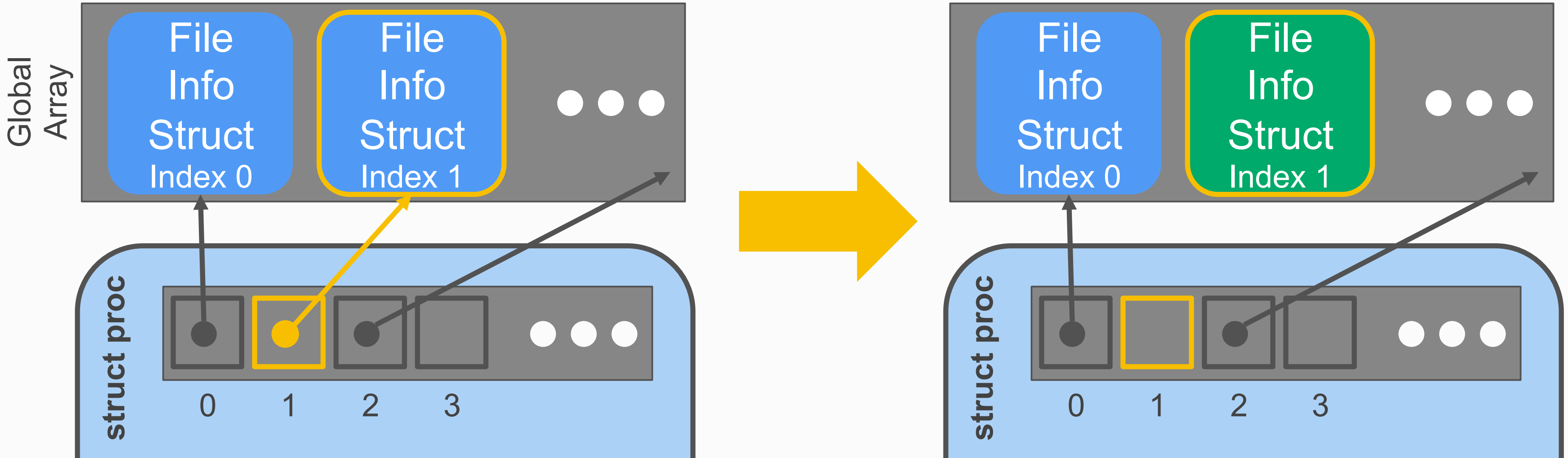
# *fileopen*

Finds an open file in the global file table to give to the process



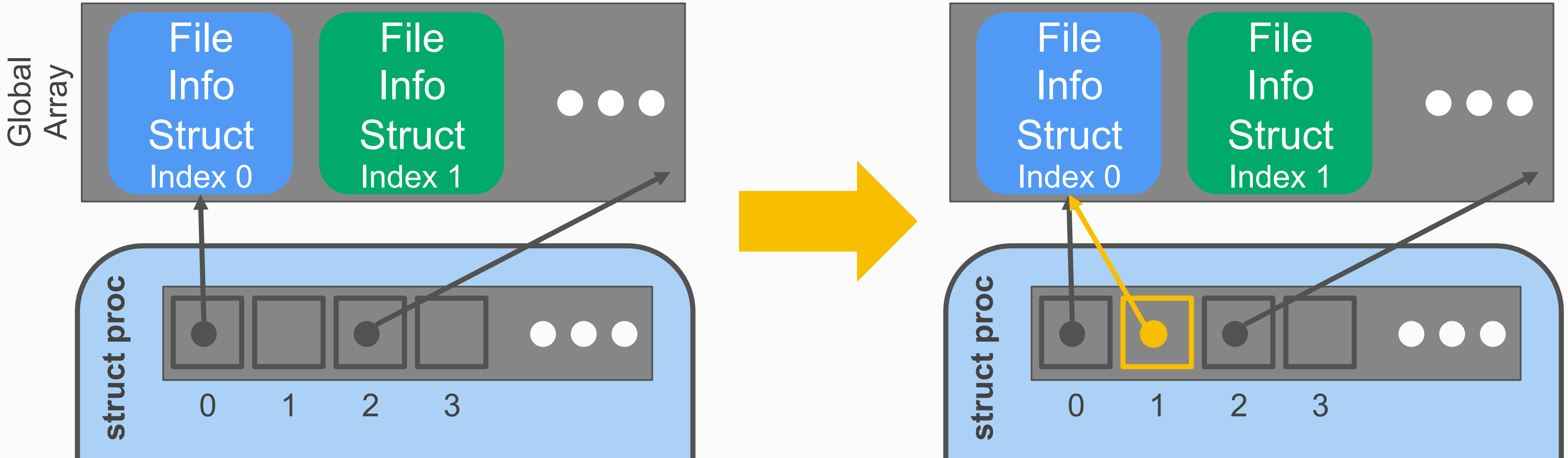
# *fileclose*

Release the file from this process, will have to clean up if this is the last reference



## *filedup*

Duplicates the file descriptor in the process' file descriptor table



## *filestat*

- Return statistics to the user about a file
- Check out the function stati in kernel/fs.c

## System Calls

- sys_open, sys_read, sys_write, sys_close, sys_dup, sys_fstat
- Main goals of sys functions
  - Argument parsing and validation (never trust the user!)
  - Call associated file functions

## Argument Parsing & Validation

All functions have int n, which will get the n'th argument. Returns 0 on success, -1 on failure

- **int argint(int n, int *ip)**: Gets an int argument
- **int argint64_t(int n, int64_t *ip)**: Gets a int64_t argument
- **int argptr(int n, char **pp, int size)**: Gets an array of size. Needs size to check array is within the bounds of the user's address space
- **int argstr(int n, char **pp)**: Tries to read a null terminated string.

You should implement and then use:

- **int argfd(int n, int *fd)**: Will get the file descriptor, making sure it's a valid file descriptor (in the open file table for the process).

## Console Input/Output

- The console device is just a special file called “console”!
- Code to handle device files is already handled for you
    - Its information is already provided for you when you open the device file.
    - Where? Look at kernel/fs.c, inc/file.h and how the T_DEV file type is used.
- I thought stdin/stdout/stderr were always available?
    - Recall that fork() copies the file descriptor table and there’s always a root process. The root process is actually what opens the console device file, and every process inherits from root, which is why stdin/stdout/stderr are available on non-root processes.

## Where is X?

From the top level of the repo, run:

```
grep -R “X” .
```

For better results, ctags is a useful tool on attu (**man ctags**) with support built into vim and emacs. There are shortcuts in vim/emacs for jumping to where a function/type/macro/variable is defined when using ctags.

## Staging of work

1. The global file table
2. File functions
3. User/Process file table
4. System calls