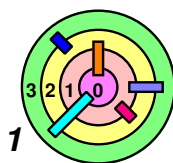


Housekeeping (Live Lecture on 7/1/2025)

- ➡ Kernel 1 is due at 11:45pm on Tuesday, 7/1/2025
 - ➡ if you have code from current or a previous semester, **do not look at/copy/share** any code from it
 - it's best if you just get rid of it
- ➡ **Grading guidelines** is the **ONLY** way we will grade and we can only grade on the grader's **standard 32-bit Ubuntu 16.04 system**
 - ➡ **don't** run kshell in a separate process
 - ➡ tests in sections (C) and (D) of the grading guidelines must run in the "foreground" and show **correct printout**
 - ➡ if you are confused about "SELF-checks", send me e-mail
- ➡ Do GDB Assignment #2
 - ➡ you need to be familiar with how to debug the kernel
- ➡ After submission, make sure you **Verify Your Ticket** and **Verify Your Kernel Submission**
 - ➡ run through the grading guidelines and pretend that you are the grader and follow every step **exactly**

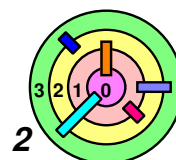


Housekeeping (Live Lecture on 7/1/2025)



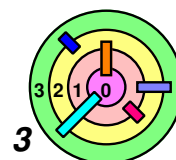
Kernel 2 is due at 11:45pm on Tuesday, 7/15/2025

- if you have code from current or a previous semester, **do not look at/copy/share** any code from it
 - it's best if you just get rid of it
- watch Discussions 8 and 9 videos
- need to do **reference counting** just right
 - read kernel 2 FAQ about "what vnodes are active"
- read and **step into** the code in `ramfs` to understand **polymorphism** (same "inode pointer" for regular file, directory, and device)
 - read comment blocks above functions and Linux man pages if necessary
 - ◆ keep in mind that weenix and Linux are not the same thing
 - ◆ keep in mind that what's in comment blocks may **not** be **our requirements**
 - ◆ our requirements are the **spec** and the **grading guidelines**



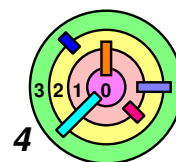
Housekeeping (Live Lecture on 7/1/2025)

- ➡ Kernel 2 implementation timeline is a bit tricky because you need to study for midterm since *exams are worth a lot*
- ➡ *(phase 1)* by this Sunday: create directories and devices in `idleproc_run()`
 - *pathname resolution* functions in "namev.c"
 - `open_namev()`, `dir_namev()`, `lookup()`
 - maybe get `do_stat()` to work to verify your code
 - ➡ *(phase 2)* soon after midterm is over: get kshell to work in `initproc_run()`
 - kernel 2 kshell uses VFS
 - `do_open()`, `do_write()`, `do_read()`,
`special_file_write()`, `special_file_read()`
 - ➡ *(phase 3)* create *kshell command* to run "vfstest"
 - pass all tests in "vfstest.c"
 - then create remaining kshell commands to pass tests in "faber_fs_test.c"



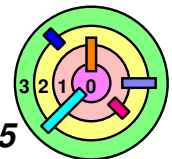
Housekeeping (Live Lecture on 7/1/2025)

- ➡ Midterm exam will be a *take-home* exam, *[9:30am-10:10am) on Tue, 7/8/2025* (USC time)
 - unlike the quiz, you *have to take the midterm at this time* (it doesn't matter which time zone you are in)
 - if I don't get a *signed pledge* from you, you will not be eligible to take the midterm exam
 - please *read what you are signing* and *keep your promises*
- ➡ You can *opt out* of midterm exam by just sending me an e-mail
 - you don't need to tell me why
- ➡ If you are registered with the Office of Student Accessibility Services (OSAS) and require specific accommodations, please make sure that I have your paperwork



Housekeeping (Live Lecture on 7/1/2025)

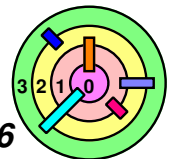
- ➡ Please practice Quiz 5 under different scenarios as a rehearsal for your midterm exam
 - for the real exam, you cannot say that you submit late because you are not familiar with some of the steps
- ➡ This Thu and Fri are university holidays, no lectures and no office hours
- ➡ We will go over the exam logistics after a quick recap on what's in the pre-recorded lecture videos



CS402 Exams

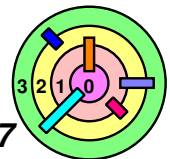
Bill Cheng

<http://merlot.usc.edu/william/usc/>



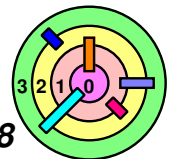
Purpose Of Exams

- ➡ Some people think that an exam is a learning experience
- not really
 - of course, you can learn from it, but that's not the main goal
 - it's more like SAT, GRE, and TOFEL tests
 - it's an *assessment*
 - ◆ because I need to give you a *fair grade*
 - you are being tested for materials you have learned *in this class*
 - ◆ it's *not* about testing your general OS knowledge
 - ◆ you are tested on *knowledge (about CS 402) + familiarity* with course material + *"critical thinking"*



Midterm Exam Coverage

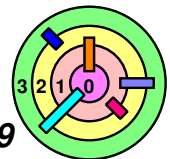
- ➡ Covers Ch 1 through Ch 4 that have been covered in lectures so far
- Ch 5 is **not** part of midterm coverage
 - also warmup1, warmup2, kernel1 (specs, FAQs, my post to class Google Group)
 - will **not** ask you to write warmup or kernel code, but can ask you about code in specs and FAQs
 - will **not** ask you to write assembly code, but can ask you about assembly code on lecture slides that have been explained



Question Types

➡ *Short answers*

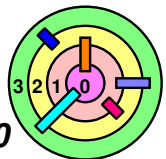
- give the *best answer* for a question
- if the question says, "In *N* words or less, ...", it's just a hint to tell you approximately how many words we expect
 - you can write more words
 - *exception*: when it's a fill-in-the-blank question (*N* would be small), then you *must not* use more than *N* words
- you get credit for including the right answer
- you get *deduction* for saying something wrong
 - cannot go below zero point
- must *not* answer a *general (high-level)* question by giving an example
- must *not* answer a *specific* question by giving a general (high-level) answer



Question Types

➡ Multiple-choice

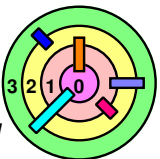
- ➡ unless **explicitly** stated, every multiple-choice question has **one or more** correct answers
 - even if the question asks, "which **statements** are correct" or "under what **condition**", it **can** have one or more right answer/s
 - ◆ please ignore minor grammatical and spelling mistakes
 - if you select all the correct choices, you get 2 points
 - ◆ if only one correct answer, it's worth 2 points
 - ◆ if two correct answers, each is worth 1 point
 - ◆ if three correct answers, first one is worth 1 point, the rest worth 0.5 point each
 - ◆ if four correct answers, each is worth 0.5 point
- ➡ for every **wrong** answer you have selected, you **lose 1 point**
 - probably not a good idea to guess (unless you are pretty sure)
- ➡ your answers must be separated by "separating characters"
 - e.g., "12" will not be interpreted as "1 2" (even though there is no 12th answer)



Question Types

➡ *Multiple-choice*

- ▬ if a statement is *inconsistent* or *incorrect*, it must be considered to be a "*false*" statement
 - if the question asked you to select all the correct statements, you must not select it
 - if the question asked you to select all the incorrect statements, you must select it



Question Types

➡ **Calculation-type** questions

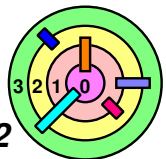
— warmup1

- e.g., calculating balance

— warmup2

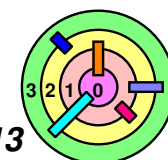
- e.g., average, standard deviation
- minimum emulation time (i.e., assuming your computer is infinitely fast and accurate)
 - ◆ if the exam time is short, this type of problem may take too much time to solve and your time may be better spent elsewhere
- this type of question can be given as a short-answer question or a multiple-choice question
 - most likely, no partial credit

➡ Total points for a problem of any type cannot go negative



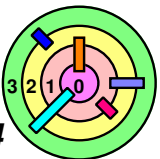
Question Types

- ➡ **Correct/best answers** to most questions in the exam are the ones **on lecture slides** (and in textbook)
- ➡ **lecture slides take precedence** since I cannot change textbook
 - ➡ please understand that exams are about materials in **this class**
 - it doesn't matter what you have read anywhere else
 - ➡ if you disagree with what's on a lecture slide, textbook, or my posts to the class Google Group, you need to complain to me **now** to set things straight
 - once the exam starts, it's too late to say that you don't like the answers on the lecture slides, textbook, or my posts
 - ➡ I reserve the right to ask about things that I think you should know and **not** on lecture slides or in textbook
 - ➡ therefore, you should focus on **studying lecture slides**
 - although it should be clear that for multiple-choice questions, the "wrong answers" are often not on lecture slides or textbook
 - ◆ you need to figure out why some answers are wrong
 - you need to **understand** lecture slides (and textbook)



Critical Thinking

- ➡ Read questions and answers carefully and *critically*
 - ▬ for every wrong answer in a multiple choice question, you should be able to *pinpoint* exactly why the choice is wrong
 - based on your *knowledge of the course material*
 - you should be able to form a *clear argument* why the answer is incorrect
 - ▬ you must take the questions and answer choices *as-is*
 - you must not add/delete/change words in the questions or answer choices



Critical Thinking

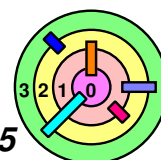


How to practice critical thinking

- form a small study group (maybe with your kernel teammates as a start, or post to class Google Group to invite others)
- study lecture slides and come up with questions based on the slides
 - short answers
 - true/false questions
 - ◆ if you answer "false", you must give a precise reason why you think the answer is false
 - ◆ this way, you develop the *habit of being precise*



One reason we have quizzes is so that you know what to expect with midterm and final exams and practice *critical thinking* with multiple choice questions



Sample Old Exams

➡ Exams from last semester is available in the Exams section of the Course Description web page

- ➡ I will **not** post solutions or tell you what correct answers are
 - you can discuss in class Google Group
 - I'd be happy to answer questions about **lecture slides**
- ➡ sample multiple-choice question:

Which of the following is correct/incorrect about X?

- ➡ sample calculation-type questions:

Q: If the sample values are 3, 4, and 5, what is the variance?

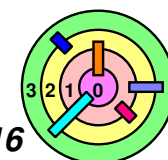
A: 0.6666

- ➡ sample "short answer" question:

Q: In 5 words or less each, what are the 3 types of questions in our exams?

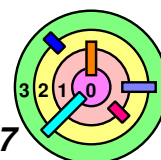
A: multiple-choice, calculation, short answer

- ➡ most questions on the exam are **multiple-choice questions**



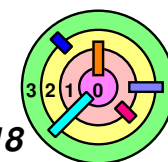
General Rules

- ➡ Read problem descriptions (especially multiple choice answers) *very carefully*
 - you may *not* receive *any credit* if you *answer the wrong question*
 - if a question has multiple parts, make sure you answer every part and clearly *label* which answer is for which part
- ➡ We will give partial credit if applicable
 - *no guarantee* that you will get partial credit
- ➡ Do not just draw pictures to answer questions (unless the question asked you to draw pictures)
 - pictures will not be considered for grading unless they are clearly explained with words
- ➡ `weenix` questions
 - if a question does *not* mention the word "`weenix`" *explicitly*, you must *not* give a `weenix`-specific answer



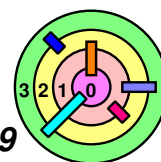
General Rules

- ➡ Please *ignore minor spelling and grammatical mistakes*
 - they do *not* make an answer invalid or incorrect
- ➡ By default we will grade your last submission
 - if you would like us to grade an earlier submission, you need to let me know soon after the exam is over
 - but some students are trying to game the system by making multiple submissions with different answers on purpose, then figure out what the right answer is after the exam
 - therefore, the rule for asking us to grade a different submission for exams will be *different* from the rule for programming assignments
 - we must grade either the *last late submission* or the *last on-time submission* (and cannot consider anything else)
 - this means that if you have both late submissions and on-time submissions, you get to choose either the last late submission or the last on-time submission
 - ◆ otherwise, no choice



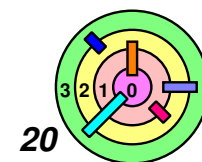
General Rules

- ➡ During the exam, you can email me questions to *clarify* problems
 - ➡ please understand that email may take days to get delivered
 - please don't count on me to reply immediately
 - I will *only* reply by posting to class Google Group
 - ◆ you should have your email opened during the exam, although email may take days to get delivered
 - ➡ please do not ask for hints or ask if "it's okay to answer this way"
 - ➡ if you ask a *non-clarification* type question, I will *not be responsible* for the answer that you think I gave
 - ➡ I will *not* answer questions regarding *multiple choice questions*
 - because it gives answers away
 - read the question carefully and choose carefully
 - ◆ need to select all the right answers and not select any of the wrong answers
 - ➡ most likely, I will *not* answer any questions during the exam (unless I have made a major mistake)
 - need to *think critically*



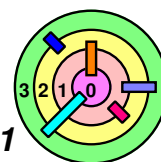
Midterm Exam Logistics

- ➡ Midterm exam: [9:30am - 10:10am), Tue, 7/8/2025
 - ➡ **Important Notation:** $[a,b)$ means $\geq a$ and $< b$
 - the left side of an interval is "closed" (i.e., includes a) and the right side of an interval is "open" (i.e., does not include b)
- ➡ Technically speaking, the midterm is a **take-home exam** and not an "online exam"
 - ➡ exams are open book, open notes, open Internet (not open friends, of course)
 - ➡ you are required to **sign an Honor Code Pledge** to promise that **you will not cheat** (including not using AI tools to answer exam questions)
 - **no signed pledge, no exam!**
 - one pledge for the midterm and one pledge for the final



Midterm Exam Logistics

- ➡ You can **opt-out** of the midterm exam and have your final exam account for 50% of your overall grade
- must let me know via email ahead of time
 - you don't need to tell me why
 - you can still opt out of the midterm even if you have submitted a signed pledge
 - no reason to wait to submit a signed pledge!
 - I do **not** recommend this at all because having your final exam worth 50% can be super stressful
 - once you have downloaded the midterm, it's too late to say that you want to opt out of the midterm exam
 - actually, if you miss the midterm for any reason, your final exam will account for 50% of your overall class grade
 - no make-up exam
- ➡ If you are registered with the Office of Student Accessibility Services (OSAS) and require specific accommodations, please make sure that I have your paperwork

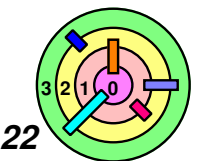


CS402

More Exam Logistics

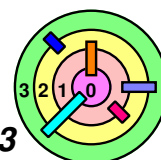
Bill Cheng

<http://merlot.usc.edu/william/usc/>



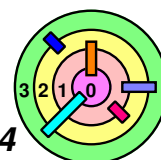
Midterm Exam Logistics

- ➡ Let's say that your exam time is [9:30am - 10:10am) (if your exam is at a different time, please adjust accordingly)
- ➡ you are required to **stop working on exam at 10:10:00am** and **finish submitting the exam before 10:13:00am**
 - if your submission timestamp is exactly 10:13:00am, it will be considered as a **late submission**
 - ➡ **starting at 10:13:00am**, you will **lose 5%** for **each late minute**
 - if your submission timestamp is $\geq 10:13:00\text{am}$ && $\leq 10:13:59\text{am}$, you will lose 5%
 - if your submission timestamp is $\geq 10:14:00\text{am}$ && $\leq 10:14:59\text{am}$, you will lose 10%
 - if your submission timestamp is $\geq 10:15:00\text{am}$ && $\leq 10:15:59\text{am}$, you will lose 15%
 - **the only timestamp** we can use is the **timestamp in the submission ticket** (i.e., my server timestamp)
 - ◆ it doesn't matter what your file system timestamp says since it can be easily forged



Midterm Exam Logistics

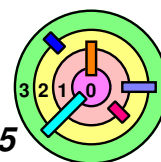
- ➡ Let's say that your exam time is [9:30am - 10:10am) (cont...)
- what if you lost Internet connection when you submit?
 - I need **proof** that you really have an Internet problem
 - ◇ you must use an **offline screen recorder** that can create an MP4 video (or something that can be converted into an MP4 video) to record submission activity **starting at 10:10:00am** as proof that you had Internet problem
 - ◇ you must follow all the instructions
 - if you don't have Internet problem, you must submit using a web form (just like submitting assignments and quizzes)
 - if you **email** your exam, it will be **at your own risk** since email delivery can take a long time
 - ◇ if you submit via email, the only timestamp I can use is the **timestamp issued by my email server** (and not by your email server)
 - ◇ by using email submission, you implicitly agree to accept both **rewards** and **risks**



Midterm Exam Logistics

➡ Let's say that your exam time is [9:30am - 10:10am) (cont...)

- 1) setup email filter to never miss an email from
<bill.cheng@usc.edu> (and never send it to spam)
- 2) by 9:25am, get your desktop ready
 - ➡ use a clock app to display a clock on your desktop that shows your local time and make sure your clock is correct
 - ➡ *start your screen recorder on your desktop* (don't start recording yet, just get it ready in case you need it later)
 - most people won't need to use it to record anything
 - hopefully, you won't need it either
 - ➡ get your submission PIN ready (same PIN as submitting assignments)
 - ➡ set an alarm clock to go off at 10:09:00am
 - ➡ if your machine is known to crash from time to time, you should reboot your machine before 9:25am
 - don't run anything you don't need for your exam



Midterm Exam Logistics

➡ Let's say that your exam time is [9:30am - 10:10am) (cont...)

3) click on the ***start exam link*** in the ***News*** section of the class home page ***about 3 minutes before the exam start time***

⇒ enter you USC Net ID and PIN and click the Submit button

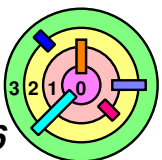
⇒ two links on the next web page

- first link to download a ZIP file that contains exam quetions (PDF file) and answers (text file)

- ◆ download it, unpack it, save ***answers text file*** on your ***desktop*** for eazy access

- 2nd link is for submitting your answers text file (same web submission form as submitting projects)

- ◆ ***click on it immediately***, check time on submission server to ***know the difference*** between the submission server clock and you desktop clock



Midterm Exam Logistics

The screenshot shows a web browser window titled "Warmup Assignment #1 - CSCI 402". The address bar shows "merlot.usc.edu/cs402-m20". The page content includes instructions for submission and a form with fields for "USC E-mail:", "Submission PIN:", "Event ID (read-only):", and "Submission File Full Path:". A red box highlights the text: "When this web page was last loaded, the time at the submission server (merlot.usc.edu) was 24Jun2020-15:03:35. Reload this web page to see the current time on merlot.usc.edu". A red arrow points from the text "reload to see changes" to this box. Another red box highlights the local time "3:05 PM" and "Wednesday, June 24, 2020" from the "Alarms & Clock" app. A red arrow points from the text "ticking would be best!" to this box.

Alarms & Clock

Alarm Clock

3:05 PM
Local time
Wednesday, June 24, 2020

Warmup Assignment #1 - CSCI 402

merlot.usc.edu/cs402-m20

Please enter your **USC e-mail address** and your **submission PIN** below. Then click on the **Upload** button to locate and select your submission file (i.e., warmup1.tar.gz). Then click on the **Upload** button. (Be careful what you click! Do **NOT** submit the wrong file!) If you see a dialog box, read the dialog box carefully and fix what needs to be fixed and repeat the procedure. If you see a submission PIN, please **click this link to enter your PIN** to enter your submission PIN.

When this web page was last loaded, the time at the submission server (merlot.usc.edu) was 24Jun2020-15:03:35. Reload this web page to see the current time on merlot.usc.edu.

USC E-mail: @usc.edu

Submission PIN:

Event ID (read-only): merlot.usc.edu_80_1557931083_61

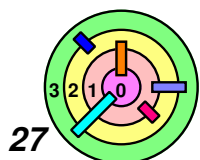
Submission File Full Path: No file selected.

If the command is executed successfully and if everything checks out, a ticket will be generated. The ticket will show "what" and "when" your submission made it to the Bistro server. The next web page you see will be the ticket and the ticket should look like [the sample shown in the submission web page](#) (of course, the ticket will be different, but the format should be similar). Also, an e-mail (showing the ticket) will be sent to your USC e-mail address. Please read the ticket carefully to know exactly "what" and "when" your submission made it to the submission server. If there are problems, please contact the instructor.

It is extremely important that you also **verify your submission** after you have submitted your submission.

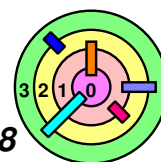
ticking would be best!

reload to see changes



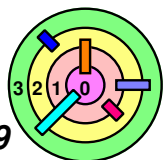
Midterm Exam Logistics

- ➡ Let's say that your exam time is [9:30am - 10:10am) (cont...)
- 3) click on the *start exam link* in the *News* section of the class home page *about 3 minutes before the exam start time* (cont...)
- ➡ a backup email is sent to your USC email address
 - don't wait for this email since this is just a backup and email can take days to get delivered
 - ➡ you can work on your exam as soon as you get the ZIP file
 - *don't make a copy* of the *answers text file* because you may end up submitting the wrong file!
 - ◆ just work on the one you saved on your *desktop*
 - ➡ if there are issues, send me email
 - but please understand that email can take a long time to get delivered
 - it's imperative that you *practice* the exam procedure by doing the *midterm rehearsal* so you know what to expect (use Quiz 4 as your midterm rehearsal)



Midterm Exam Logistics

- ➡ Let's say that your exam time is [9:30am - 10:10am) (cont...)
- 4) when you have finished your first pass through the exam, make a submission (it should only take a few seconds)
 - ➡ if you see a submission *ticket*, verify that the *file name* and *file size* look right and *Verify Your Ticket*
 - save web page as PDF as a record of your submission
 - ➡ feel free to make additional submission if you change your answers text file
 - 5) when your alarm goes off at 10:09:00am, you need to wrap things up and get ready to submit your answers text file
 - 6) at 10:10:00am, you *must stop working* on your answers
 - ➡ I cannot stress enough how important it is to *drop everything and do this* at 10:10:00am
 - ➡ if your answers text file is the same as your most recent submission, then you are *done* (feel free to make additional submission if you changed your answers text file)
 - ➡ otherwise, proceed to step (7)



Midterm Exam Logistics

➡ Let's say that your exam time is [9:30am - 10:10am) (cont...)

7) reload the submission web page

- ➡ if **successful** (i.e., you have Internet connectivity), note the difference between server time and your desktop time
 - make a submission
 - if you get a server error, just **keep trying**
 - ◆ server is busy because too many students are submitting at the same time
 - ◆ you have 3 minutes, sooner or later, your submission will go through
 - ◆ this is why **you must start submitting at 10:10:00am**
 - if you see a submission **ticket**, follow the **Verify Your Ticket** procedure and notice the **server timestamp**
 - ◆ save web page as PDF, this is your proof that your submission has made it to my server
 - ◆ one proof is enough and you do not need to see the backup email that contains the ticket

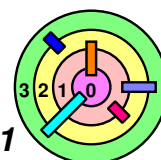


Midterm Exam Logistics

➡ Let's say that your exam time is [9:30am - 10:10am) (cont...)

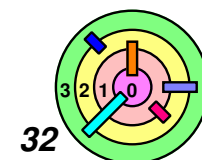
7) reload the submission web page (cont...)

- ➡ if **unsuccessful** (i.e., you have **no Internet** connectivity), **start recording** your desktop right away as proof that you don't have connectivity at 10:10am
 - **open answers text file** and **record its entire content** in your video **one page at a time** and take **photos** with your cellphone
 - ◆ when you are done, **reload the browser** to prove that you still don't have Internet connectivity
 - ◆ **make sure your desktop clock** is being recorded
 - **stop recording** (before 10:13:00am), do not delete your video and photos
 - ◆ **send me an email** from your cellphone **immediately**, **attach photos** and let me know that **you have Internet problem at 10:10am** AND **you have a video proof**
 - ◆ do **not** send me the video unless I ask for it



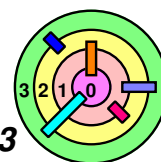
Midterm Exam Logistics

- ➡ Let's say that your exam time is [9:30am - 10:10am) (cont...)
- 7) reload the submission web page (cont...)
- ➡ if **unsuccessful** (cont...)
 - **when you get your Internet back**, submit your answers text file using the submission web form
 - ◆ save ticket web page as PDF and send me email to let me know that you have got your Internet back
 - ◆ your answers text file should be identical to the one in the video and in the photos
- ➡ Please remember that the **only** timestamp we can use to determine late submission penalty is the **timestamp in the submission ticket**

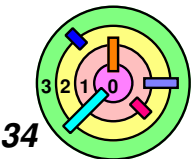
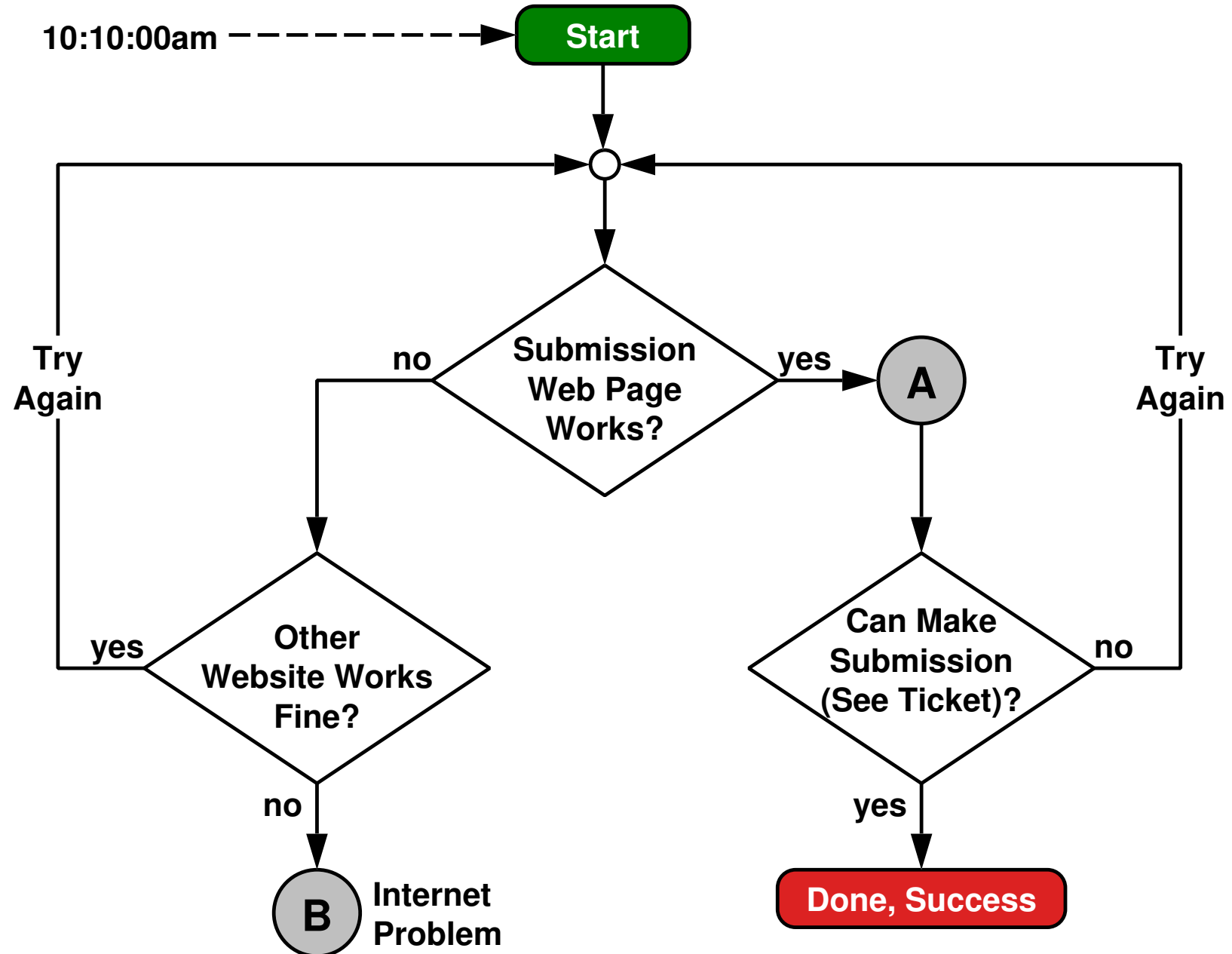


Offline Screen Recorders

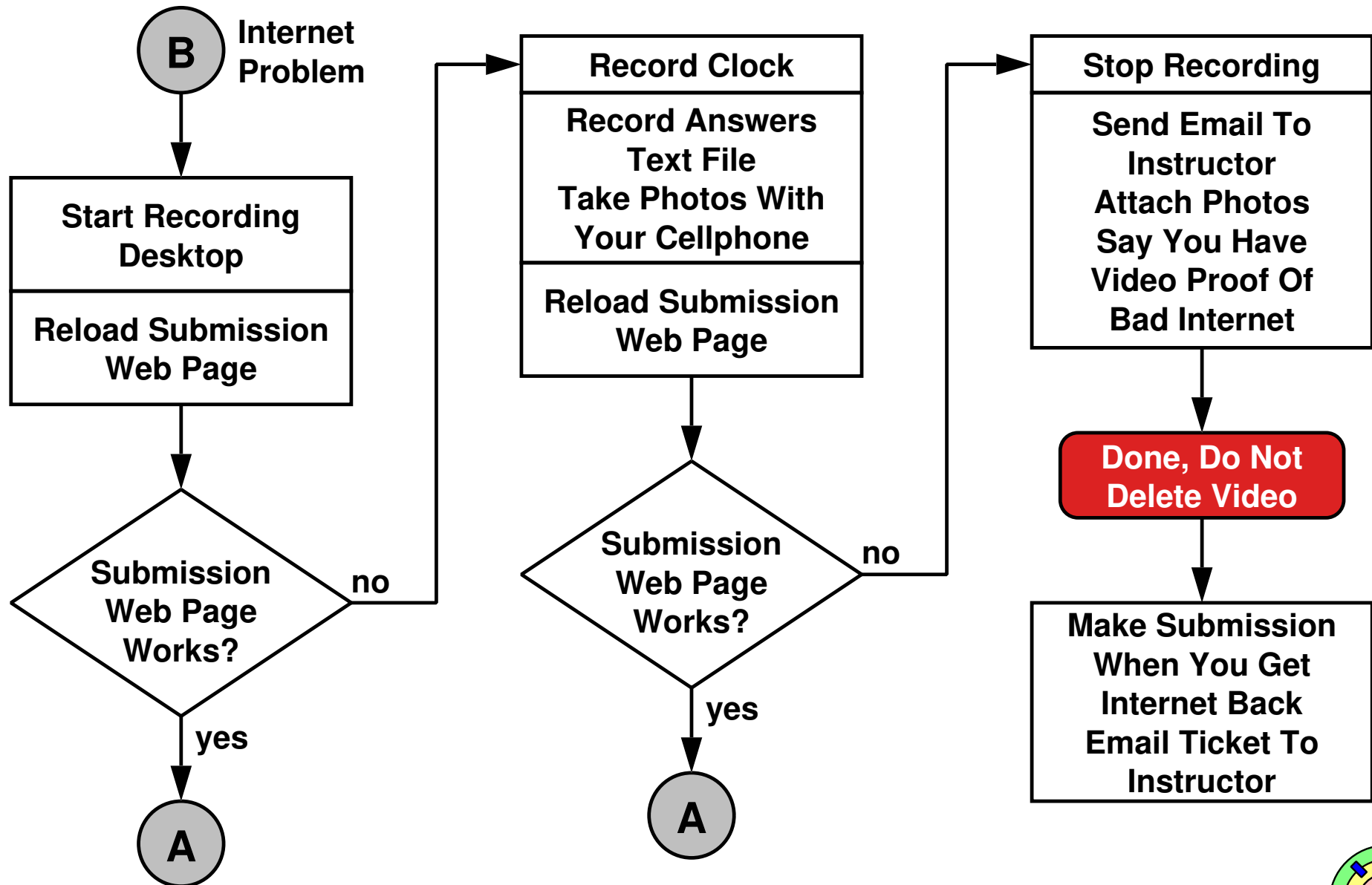
- ➡ On Windows 10/11, you can use the Game Bar or the Snipping Tool
 - <Win+G> or <Win+Shift+R>
- ➡ On MacOS, you can use the Quicktime Player app
 - click on the File Menu and click on New Screen Recording
- ➡ You can use your smartphone as a video recorder if your cellphone can create MP4 videos (i.e., Android) or MOV videos (i.e., iPhone)
- ➡ Remember, you must record the clock app on your screen showing the current time
- ➡ You need to *practice* to make sure that it can record video in the MP4 or MOV format
 - disable wifi to simulate Internet connectivity problem
- ➡ I don't know for sure if the above screen recorders are truly offline recorders or not, please let me know if they are not



Step (7) Flow Chart

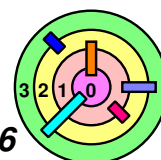


Step (7) Flow Chart



Midterm Exam Logistics

- ➡ What if your **machine crashed** when you are making a submission and it takes 5 minutes to reboot?
- I need **proof** that your machine crashed
 - start recording with your smartphone immediately to record your machine as it restarts and **record the entire process**
 - as soon as the machine is up and running, open your **answers text file** and scroll through it to record its **entire content**
 - keep recording and **submit** your **answers text file** using the **submission web form**
 - now you can **stop recording**, don't delete the video
 - ◆ **send me an email immediately**, let me know that **your machine crashed AND you have video proof**
 - ◆ do **not** send me your video unless I ask for it
- ➡ If your machine is prone to crashes, you should make multiple submissions earlier!



Midterm Exam Rehearsal

- ➡ Please use Quiz 5 as a *rehearsal* for midterm
 - ▬ practice all the steps so you know what to expect
 - practice as many time as you would like
 - *try out different scenarios* (e.g., disable wifi to simulate Internet connectivity problem)
- ➡ For the real exam, you cannot say that you submit late because you are not familiar with some of the steps

