CMSC388N:

Build It, Break It, Fix It: Competing to Secure Software

Lecture 6 - Bug Hunting Strategy

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COMPUTER SCIENCE
UNIVERSITY OF MARYLAND

The Plan

- Administrivia
- Bug hunting strategy
- In-class build/break time!

Administrivia

There will **not** be another extension

- Semi-deadline extension
  - Source for everyone's project is in the break_source repo
  - Teams that did not finish have an additional day extension
  - If your code works locally, but not on the grading server, please show us and we will give you points for it
  - Design doc v2 and mid-course surveys due tomorrow (1/16) by midnight

Administrivia

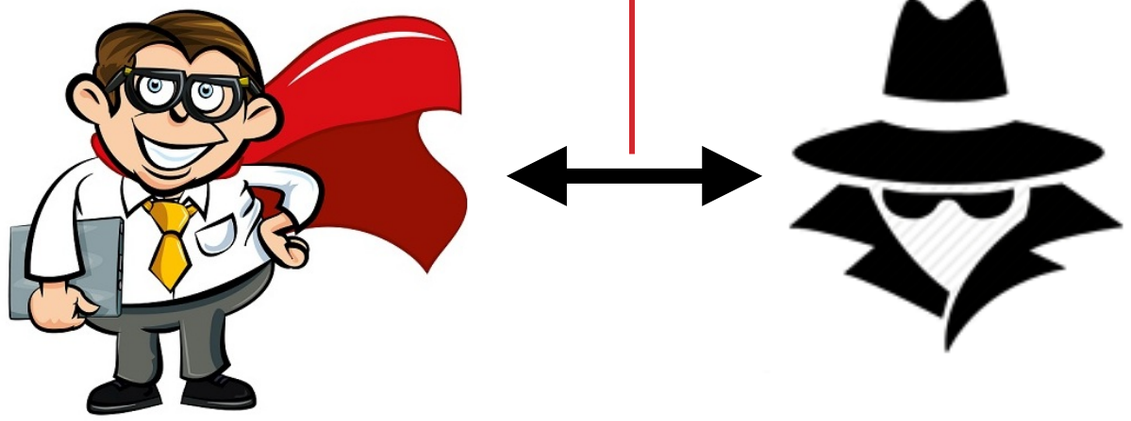
Break updates

- No correctness bugs
- Only **3** breaks required for min criterion
- Submit break descriptions for teams whose code can't compare to the oracle
  - Include json test case if it works locally
  - State in that it is infeasible to break because their code doesn't run
  - Worth 100 points, but does not accumulate over time

How to find bugs?

Bug Hunters!

Adversarial Mindset!



General bug finders:

- **Functionality**
- **Performance**
- **Security**

White-hat Hackers:

- **Security Team**
- **Penetration Testers**
- **Bug Bounty**

Questions

1. How do Testers and Hackers search for vulnerabilities?
2. What is the difference between the groups?

Interview and Observations:

- Vulnerability Discovery task analysis	**10**	**15**
- Reverse engineering observations		**16**
		41

Questions

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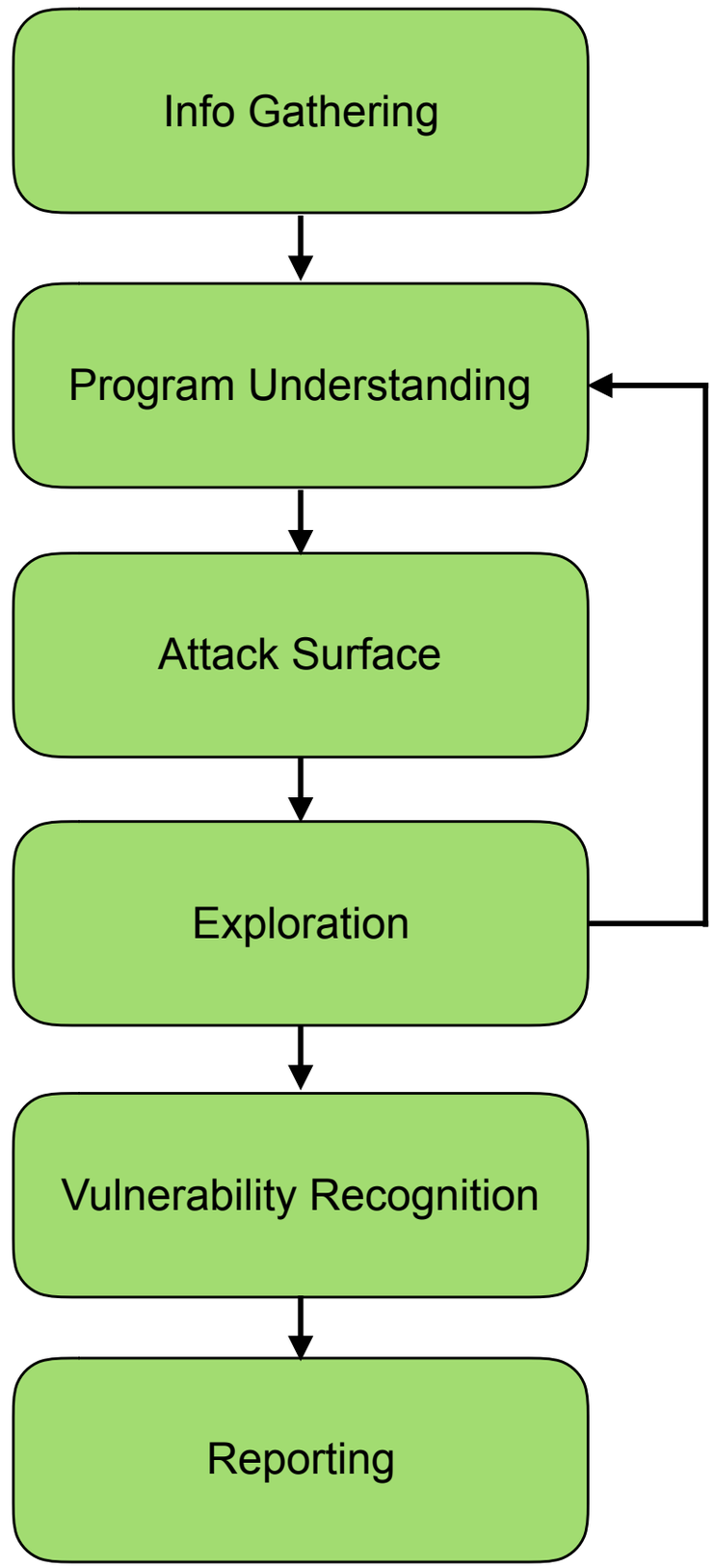
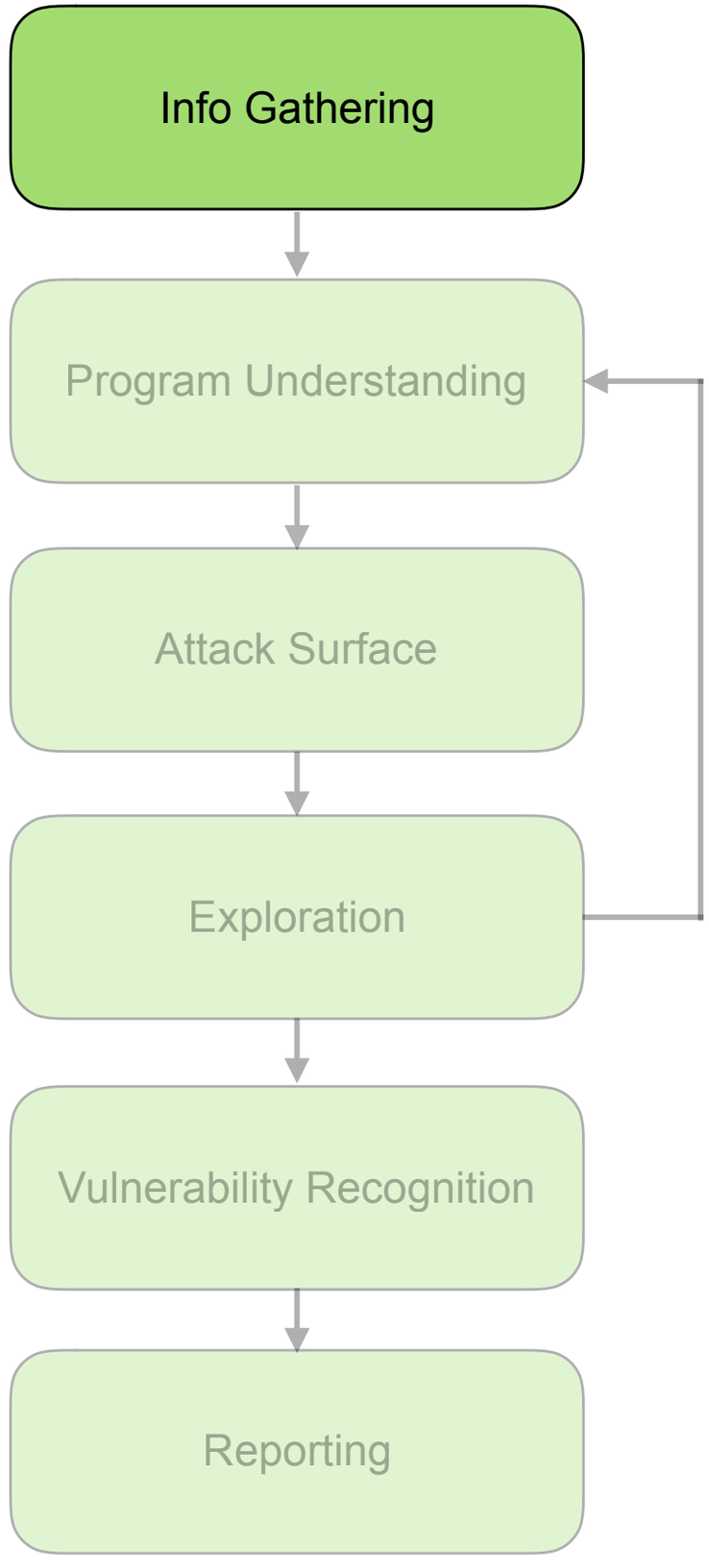
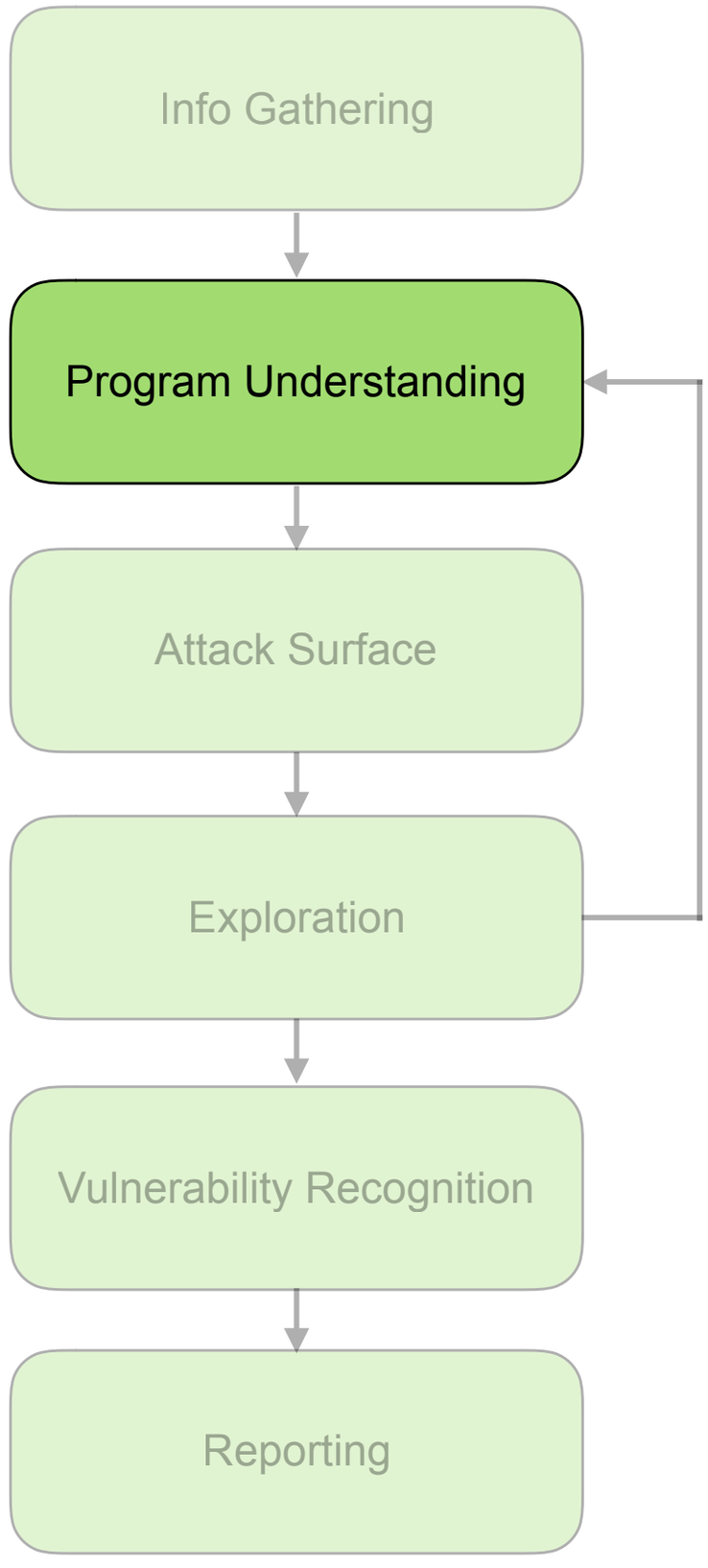

Info Gathering
Program Understanding
Attack Surface
Exploration
Vulnerability Recognition
Reporting

- Build context prior to reading or executing code
- Example actions:
  - Language
  - Libraries
  - File sizes
  - Bug history



- Determine how the program operates
  - Interaction between components
  - Interaction with the environment

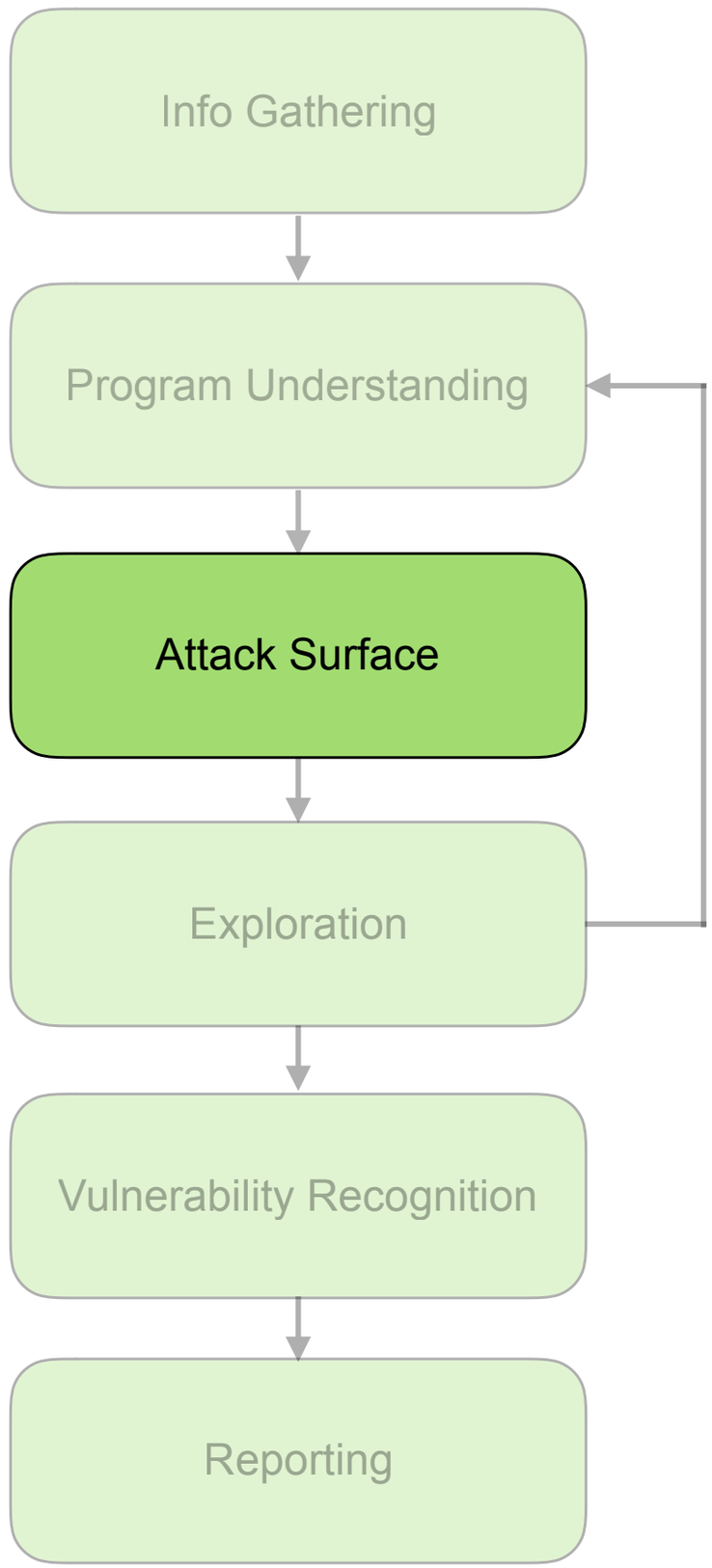
- Example actions:
  - Run the code with basic inputs
  - Scan for important functions by name



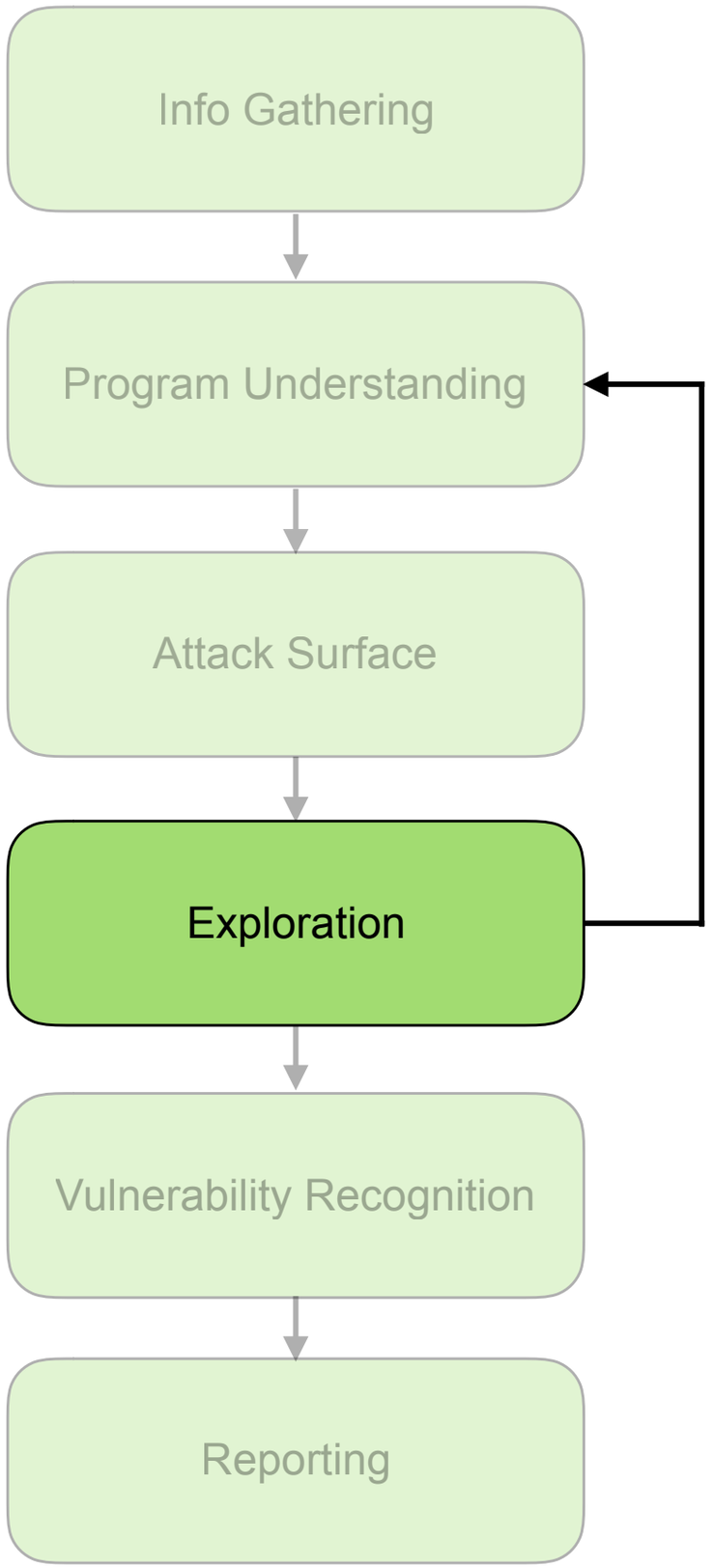
"You're touching a little bit everything, and then you are organizing that into a structure in your head."

"If we allow logins from a 3rd party provider, I would check the way we handle that data."

- Identify how user interacts with program
- Direct and indirect inputs
- Example actions:
- Identify code handling inputs
  - Command line
  - Programs from the network
  - Config file



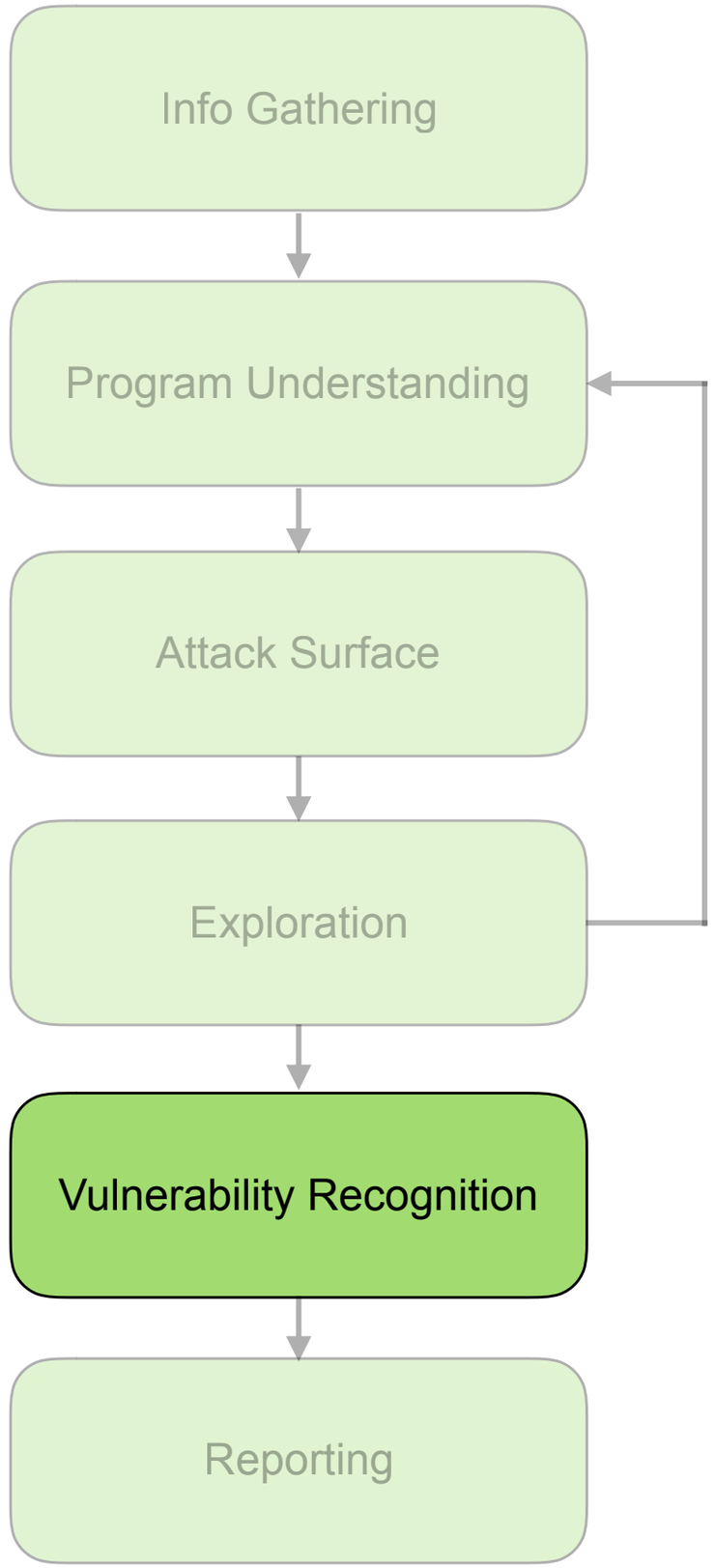
- Possible inputs to the attack surface
- Example actions:
  - Fuzzing (manual/automated)
  - Read code
    - Skim control/data flow paths



"I have in my mind a set of possible bugs…if there's a loop going through my input, it could be going out of bound on the array…and I start to look at the code. See if something comes to my mind."

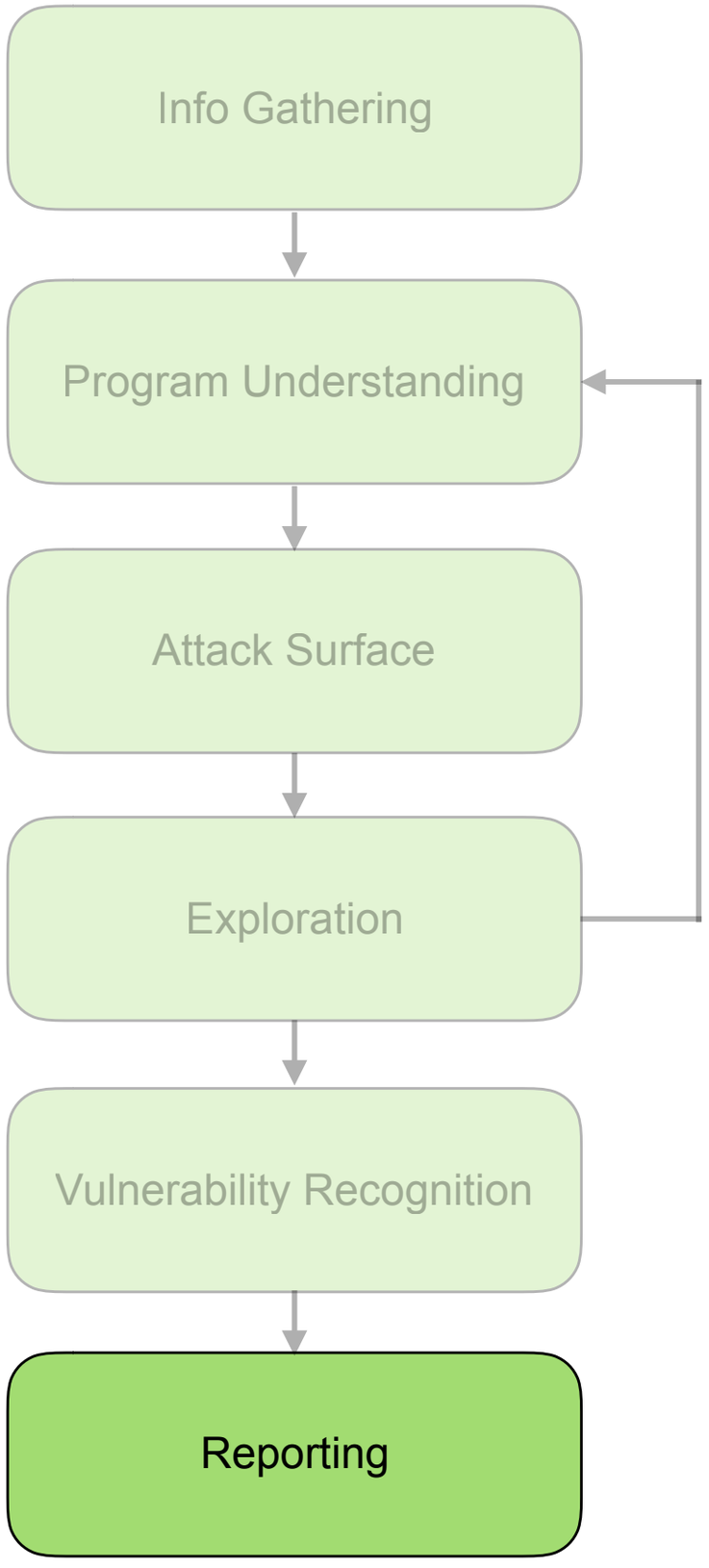
"Basically there's a library of considerations that you develop through experience and understanding the code base and the products."

- Notice a problem when exploring
- Typically intuition-based



"You do have to [convince] someone that there's a risk. …It's quite timely [time consuming], running a ticket."

- Tell developers about the problem
- Advocate for remediation
- Critical aspects:
  - Make report understandable
  - Importance of fixing



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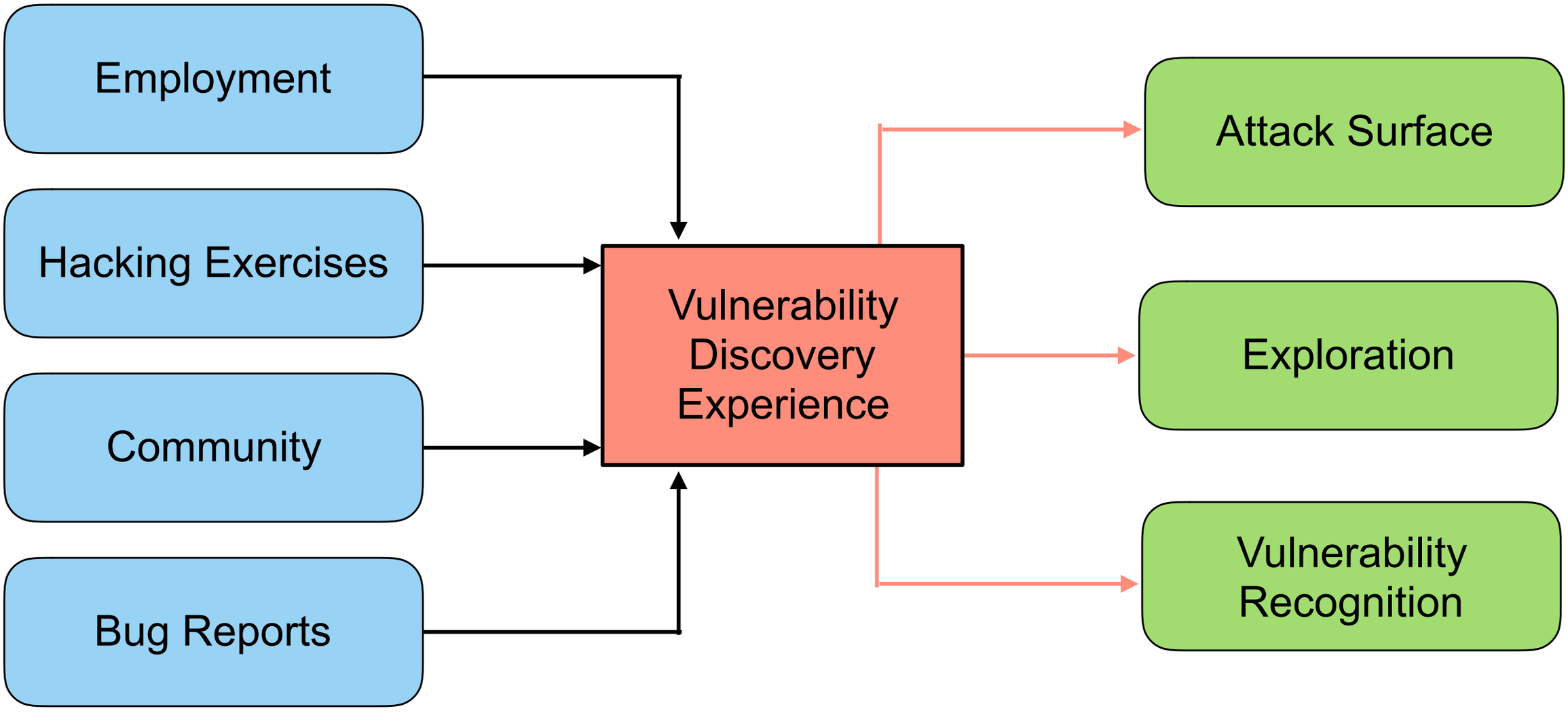
Employment
Hacking Exercises
Community
Bug Reports
Vulnerability Discovery Experience
Attack Surface
Exploration
Vulnerability Recognition

Employment

Hacking Exercises

Community

Bug Reports

Vulnerability Discovery Experience

Summary

- Bug hunting strategy
  - Information Gathering
  - Program Understanding
  - Attack Surface
  - Exploration
  - Vulnerability Recognition
  - Reporting
- Vulnerability discovery skill development

In-class Build/Break Time!

- Divide up into teams and spread out
  - You can leave this room, but stay on this floor
    - Send us a message in Slack with where you go
- Things to do:
  - Finish build
  - Design doc v2
  - Strategize for break round