

Code coverage

Introducing it to your pipeline

OVERVIEW

Meet the group

POWERPOINT ENGINEER

[@landeholt](#)

SOFTWARE ENGINEER

[@personligapersson](#)

OVERVIEW

What gets measured gets done

OVERVIEW

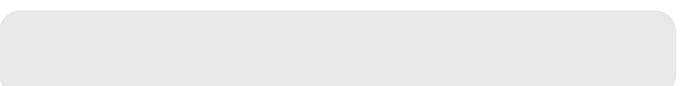
What gets measured gets done

- That f***ing manager

OVERVIEW

Structure

WHAT



OVERVIEW

Structure

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THE PROBLEM

OVERVIEW

Structure

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OVERVIEW

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TAKEAWAYS

WHAT

What is code coverage?

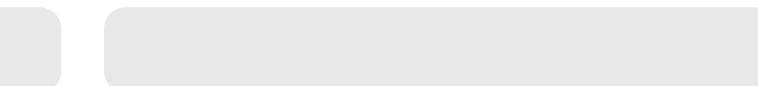
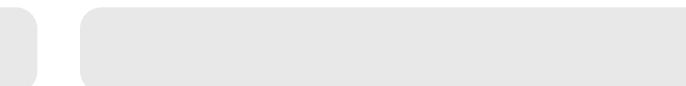
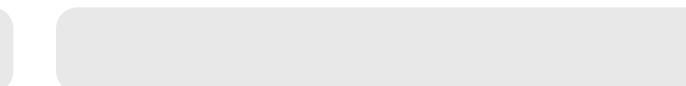
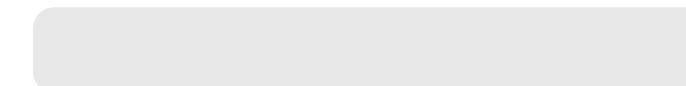
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Execution

Through code execution, the tool can **evaluate what lines that was executed**

This is usually done in combination with a testing suite

Analysis

Comparing to source code, the tool can base a **metric of coverage.**

Reporting

By accumulating data, the tool can visualize what branches aren't being executed.

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WHAT: EXAMPLE TOOLING

Coverage.py +
Pytest.py = ❤

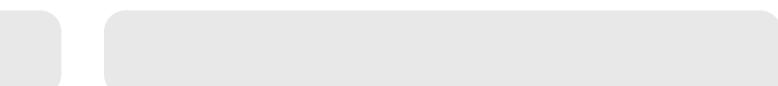
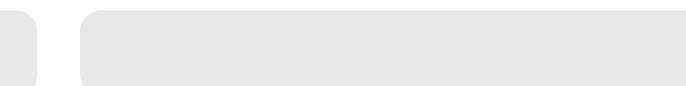
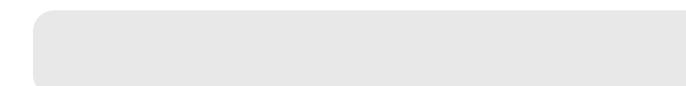
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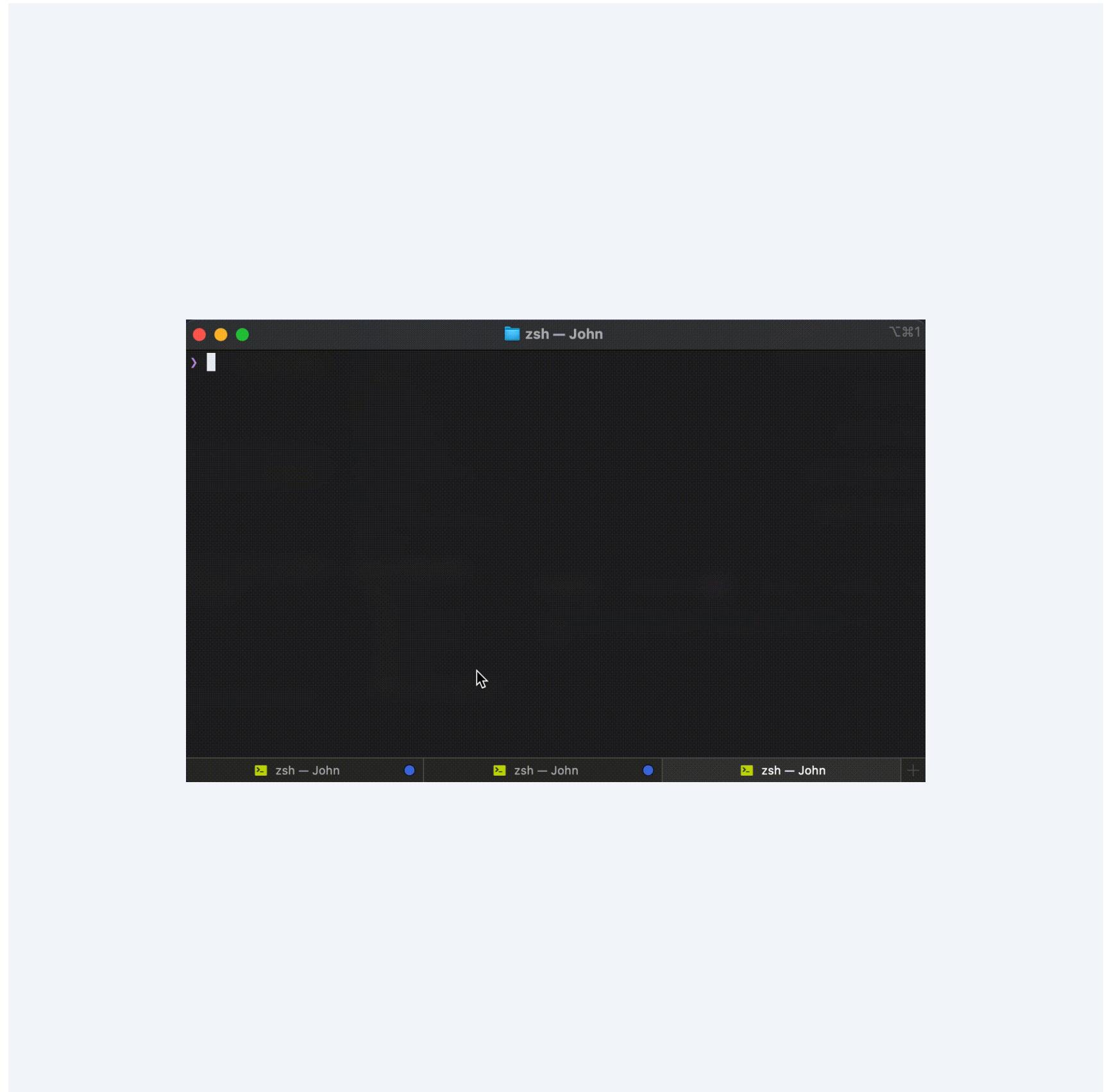
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WHAT: EXAMPLE TOOLING



Coverage.py

Executes pytest that
consequently executes
your test cases

```
pip install coverage  
$ python -m coverage
```

Pytest.py

Provides test cases for
your project

```
pip install pytest  
$ python -m pytest
```

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WHY

Benefits

- Cost effective technique to deliver high code quality
- Risk mitigation strategy, no **conditionals** are left behind
- Advertisable, a project with 100% code coverage is less prone to errors than one with 70%
- Accountable, commits that **degrades** code coverage is measurable
- Helps to find forgotten test cases
- Reduced risks of **false positives**
- Key performance indexable (KPI)

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Drawbacks

- Adds **overhead (time)** to the CI/CD pipeline
- Is computational **expensive**
- Is language dependent
- May introduce a **false sense of security**
- Annoying to maintain yet another metric (KPI)

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Tests are
computational
expensive

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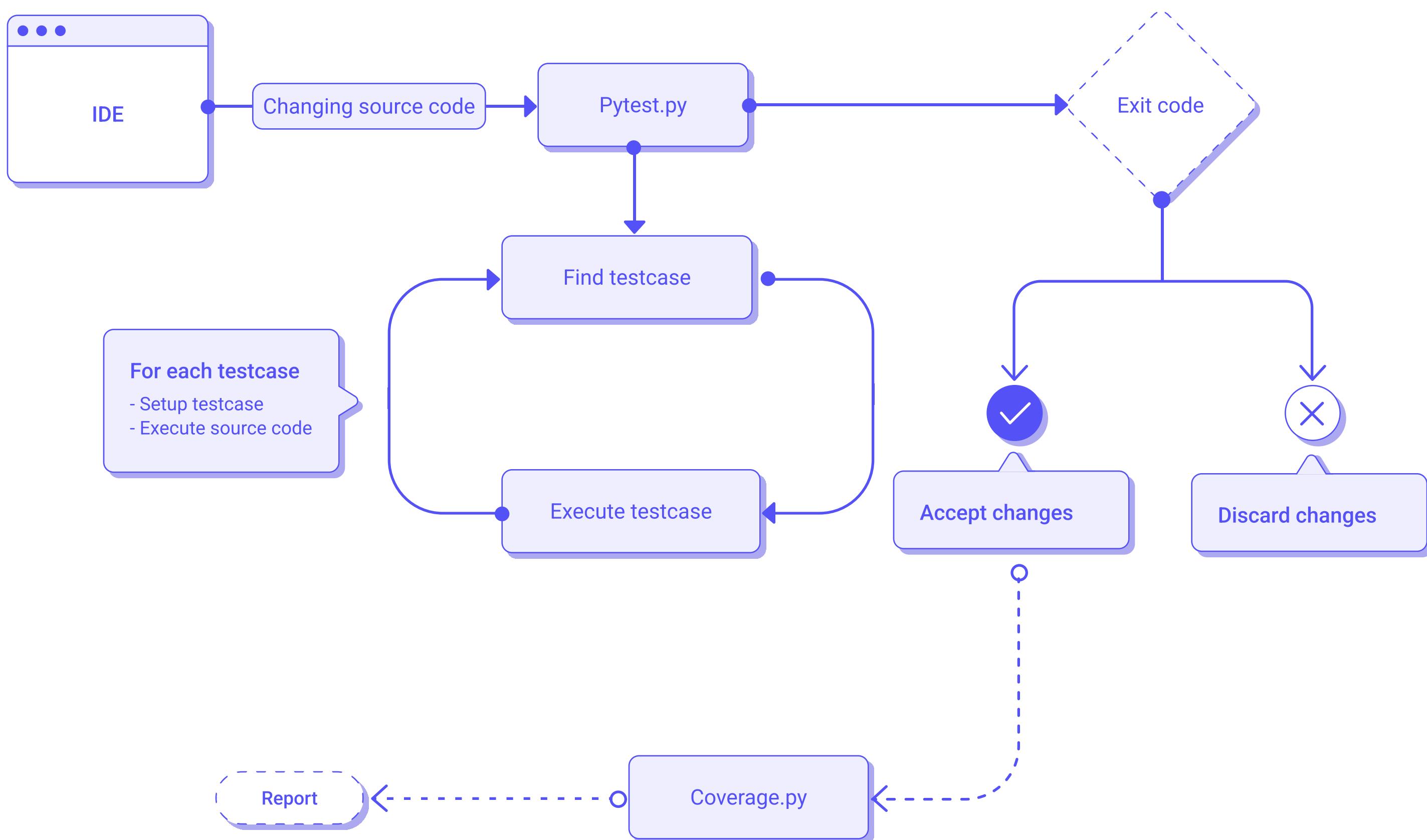
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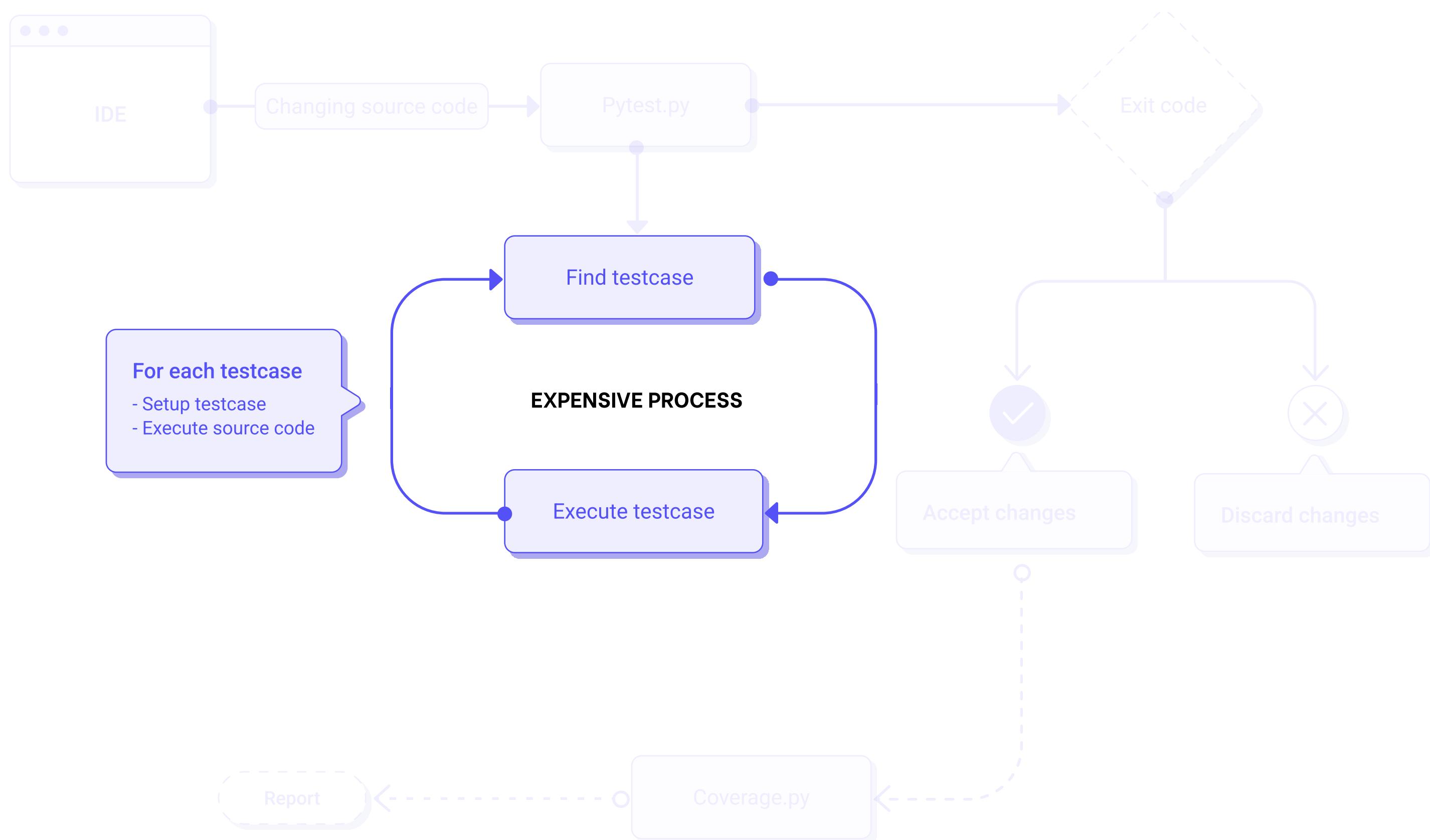
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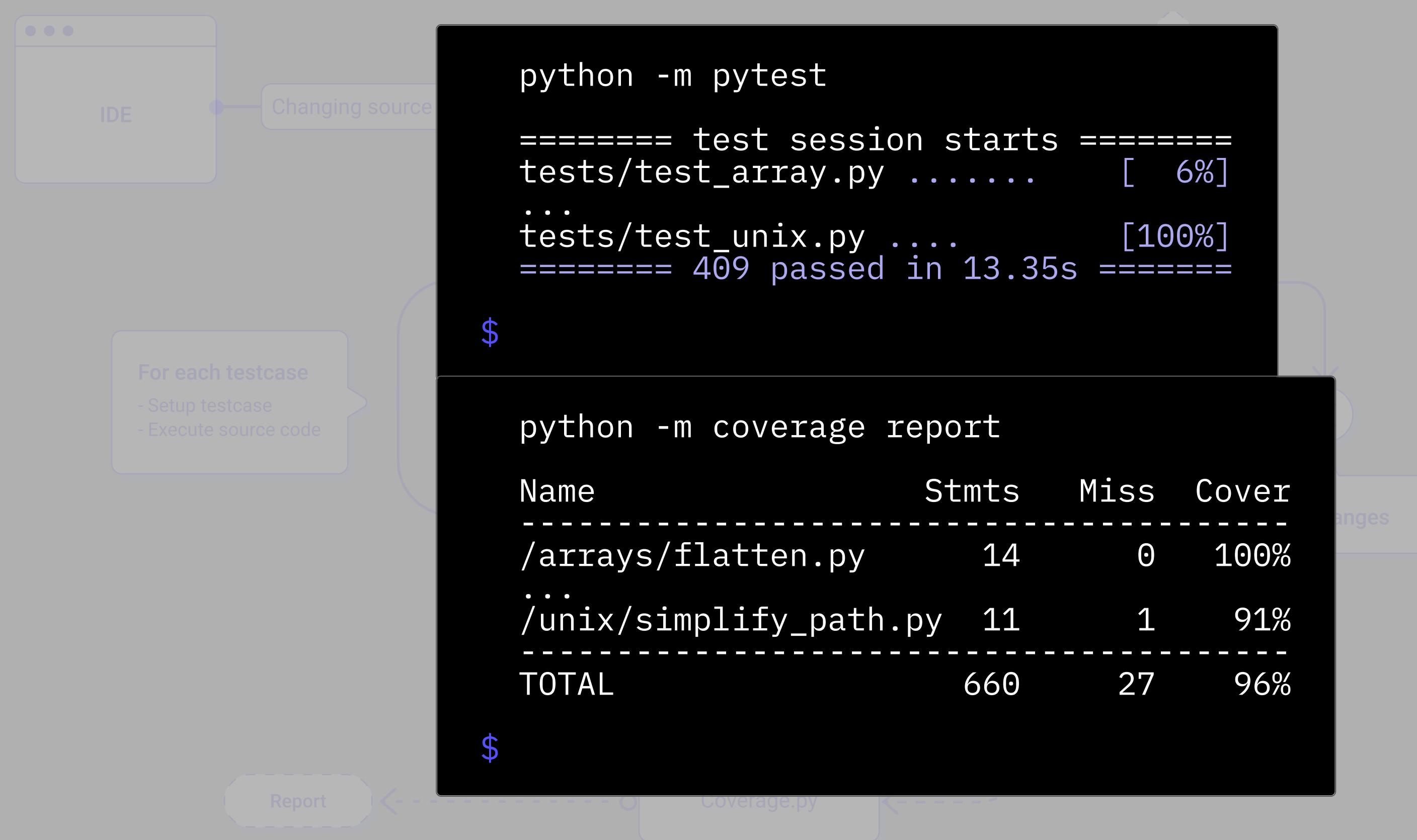
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The naïve approach

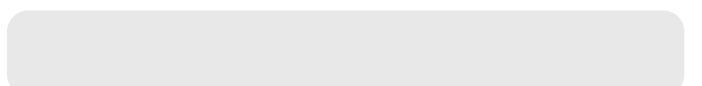
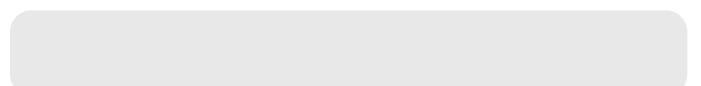
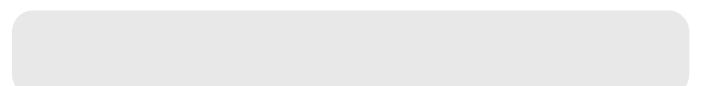
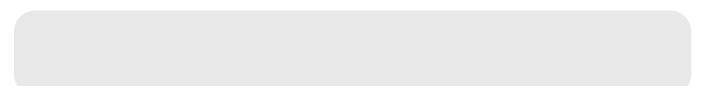
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HOW: SOTA

The naïve approach

Brute force

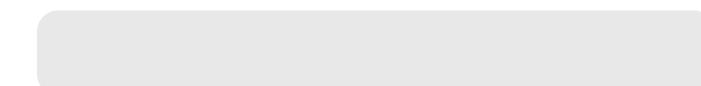
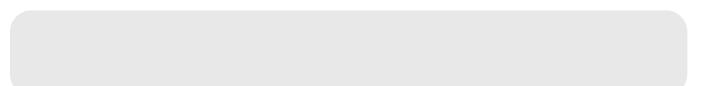
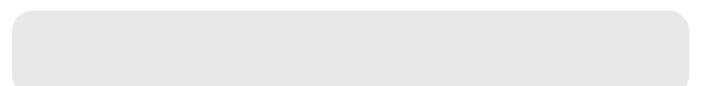
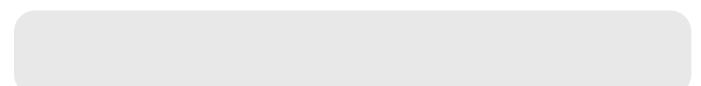
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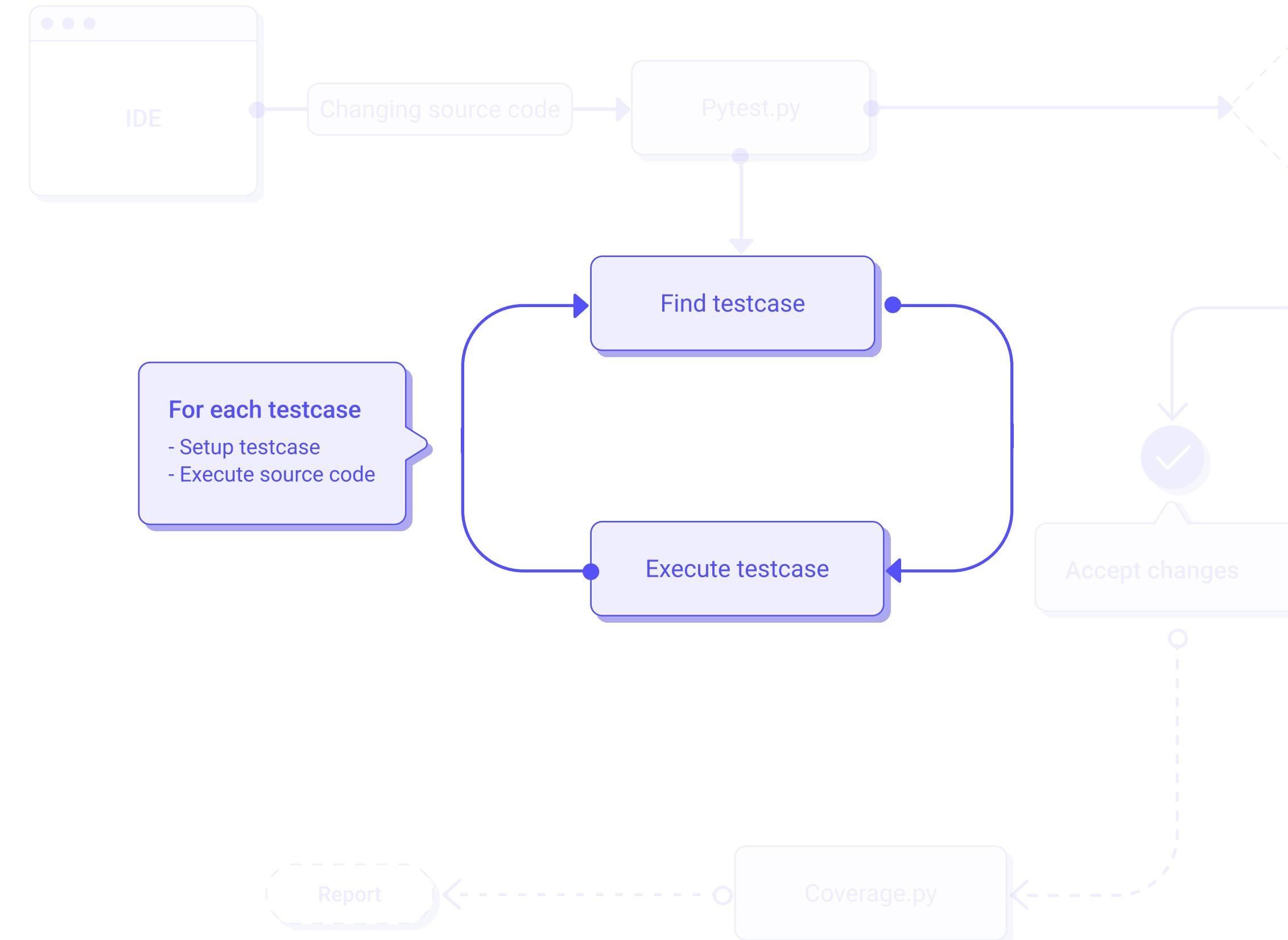
TAKEAWAYS



HOW: UTILIZING MORE CORES

The naïve approach

Parallelization



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TAKEAWAYS

HOW: UTILIZING MORE CORES

The naïve approach

Parallelization

```
def execute_process(file):
    run(["coverage", "run", "-m", "pytest", file], shell=True)

if __name__ == '__main__':
    freeze_support()
    start = time.perf_counter()
    l = glob.glob('**/test_*.py')
    processes = []

    for _ in l:
        p = Process(target=execute_process, args=(_,))
        p.start()
        processes.append(p)

    for p in processes:
        p.join()

    end = time.perf_counter()
    print(f'Elapsed time: {round(end-start,2)} s')
```

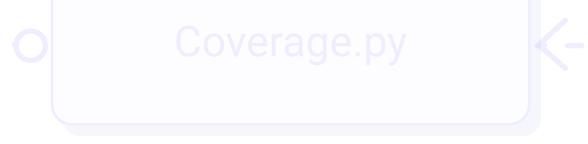
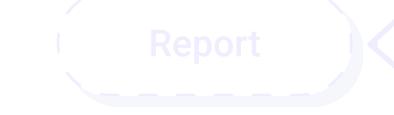
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HOW: UTILIZING MORE CORES

```
python -m pytest
=====
test session starts =====
tests/test_array.py ..... [ 6%]
...
tests/test_unix.py .... [100%]
===== 409 passed in 13.35s =====
```

\$

200% speed up

By spawning **multiple** processes for each test case, we decreased time spent with a factor of **2**.

```
python brutetest.py
2 failed, 407 passed in 5.17s
.:. failed, 407 passed in 8.05s
Elapsed time: 6.38 s
```

\$

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TAKEAWAYS

HOW: UTILIZING SOTA

The heuristic approach

Version-control



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TAKEAWAYS

HOW: UTILIZING SOTA

```
39 def get_imports(module_path: Path):
40     modules_before = set(sys.modules)
41     if not module_path.exists():
42         return set()
43
44     path = module_path.resolve().absolute()
45     spec = spec_from_loader("module.name", SourceFileLoader("module.name", str(path)))
46     if spec and spec.loader:
47         mod = module_from_spec(spec)
48         spec.loader.exec_module(mod)
49
50     modules_after = set(sys.modules)
51
52     modules_found = modules_after.difference(modules_before)
53
54     for m in modules_found:
55         sys.modules.pop(m)
56
57     return modules_found
58
59
60
61 def glob_tests(root_dir: Path, test_folder: Path):
62
63     test_imports: list[PickData] = []
64
65     sys.path.append(str(root_dir))
66     for path in test_folder.glob("test_*.py"):
67         imports = get_imports(path)
68         test_imports.append(
69             PickData(
70                 path=path,
71                 dependants=set(filter(lambda x: x.startswith(root_dir.name), imports)),
72             )
73         )
74
75     return test_imports
```

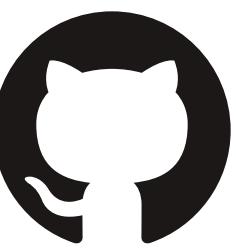
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pytest-testmon
@tarpas



pytest-picked
@anapaulagomes

HOW: UTILIZING SOTA

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39 def get_imports(module_path: Path):
40     modules_before = set(sys.modules)
41     if not module_path.exists():
42         return set()
43
44     path = module_path.resolve().absolute()
45     spec = spec_from_loader("module.name", SourceFileLoader("module.name", str(path)))
46     if spec and spec.loader:
47         mod = module_from_spec(spec)
48         spec.loader.exec_module(mod)
49
50     modules_after = set(sys.modules)
51     modules_found = modules_after - modules_before
52
53     for m in modules_found:
54         sys.modules.pop(m)
55
56     return modules_found
57
58 def glob_tests(root_dir: Path) -> list[Path]:
59     test_imports: list[Path] = []
60
61     sys.path.append(str(root_dir))
62     for path in test_folders:
63         imports = get_imports(path)
64         test_imports.append(PickData(
65             path=path,
66             dependants=imports))
67
68     return test_imports
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77
78     def get_unstaged_paths(root_dir: Path):
79         raw_output = subprocess.run(["git", "status", "--short"], capture_output=True)
80         output = raw_output.stdout.decode(encoding="utf-8")
81         pattern = re.compile(r"([ MTAU\?]{2}) ([^ \->]+)(?: \->(.*))?")
82         filepaths = output.splitlines()
83
84         paths = set()
85         for line in filepaths:
86             match = pattern.match(line)
87             if match:
88                 code, orig_path, path = match.groups()
89                 if path:
90                     p = root_dir / path
91
92                 else:
93                     p = root_dir / orig_path
94
95                 path = orig_path
96
97                 if p.is_file() and is_py(p):
98                     paths.add(".".join(p.with_suffix("").relative_to(root_dir).parts))
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```

HOW: UTILIZING SOTA

```
39 def get_imports(module_path: Path):
40     modules_before = set(sys.modules)
41     if not module_path.exists():
42         return set()
43
44     path = module_path.resolve().absolute()
45     spec = spec_from_loader("module.name", SourceFileLoader("module.name", str(path)))
46     if spec and spec.loader:
47         mod = module_from_spec(spec)
48         spec.loader.exec_module(mod)
49
50     modules_after = set(sys.modules)
51     78     def get_unstaged_paths(root_dir: Path):
52     79         raw_output = subprocess.run(["git", "status", "--short"], capture_output=True)
53     80         output = raw_output.stdout.decode(encoding="utf-8")
54     81         pattern = re.compile(r"([ MTAU\?]{2}) ([^ \-\\>]+)(?: \\->(.*))?")
55     for m in modules_found:
56         82             filepaths = output.splitlines()
57         sys.modules.pop(m)
58
59     return modules_found
60
61     84     paths = set()
62     85     for line in filepaths:
63     86         match = pattern.match(line)
64     87         if match:
65     88             code, orig_path, path = match.groups()
66     89             if path:
67     90                 p = root_dir / path
68     91             else:
69     92                 p = root_dir / code
70     93             test_imports.append(PickData(
71     94                 path=path,
72     95                 dependants=set(filter(lambda x: x.startswith(root_dir), paths))
73     96             )
74     97             if p.is_file() and p.suffix == ".py":
75     98                 paths.add(".".join(p.parts[-2:]))
76
77     return test_imports
78
79     return paths
80
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WHAT

WHY

THE PROBLEM

HOW

TAKEAWAYS

HOW: UTILIZING SOTA

∞ speed up

We only tests relevant testcases from unstaged files accordingly to git version control.



WHAT

WHY

THE PROBLEM

HOW

TAKEAWAYS

HOW: UTILIZING SOTA

∞ speed

```
git status
On branch master
Your branch is up to date with 'origin/master'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
    modified:   algorithms/arrays/flatten.py
    modified:   algorithms/unix/path/split.py
    modified:   tests/test_array.py
$
```

We only tests relevant testcases from unstaged files accordingly to git version control.

WHAT

WHY

THE PROBLEM

HOW

TAKEAWAYS

HOW: UTILIZING SOTA

∞ speed

```
py tooling/yore.py
=====
test session starts =====
collected 32 items
tests/test_unix.py .... [ 12%]
tests/test_array.py ..... [100%]
=====
32 passed in 0.23s =====
$
```

We only tests relevant testcases from unstaged files accordingly to git version control.

WHAT

WHY

THE PROBLEM

HOW

TAKEAWAYS

TAKEAWAYS

01

Looking at code coverage is a good thing and good tools are available.

02

Adding coverage analysis to your CI/CD pipeline may introduce overhead.

03

The naive approach to parallelization is beneficial but “stupid”.

04

Using a heuristic to reduce redundant analysis is key to improving efficiency.

WHAT

WHY

THE PROBLEM

HOW

TAKEAWAYS

Thank You

Questions?