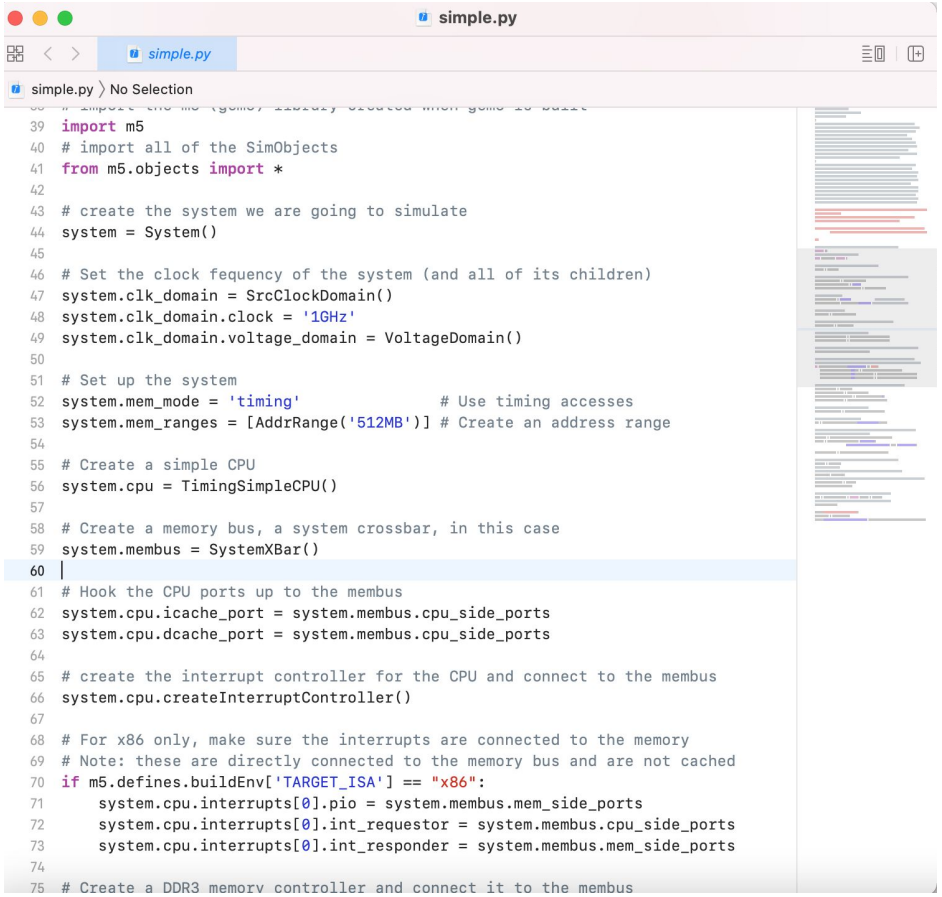
DEMOCRATIZING COMPUTER SCIENCE SIMULATION WITH A COMPONENTS LIBRARY

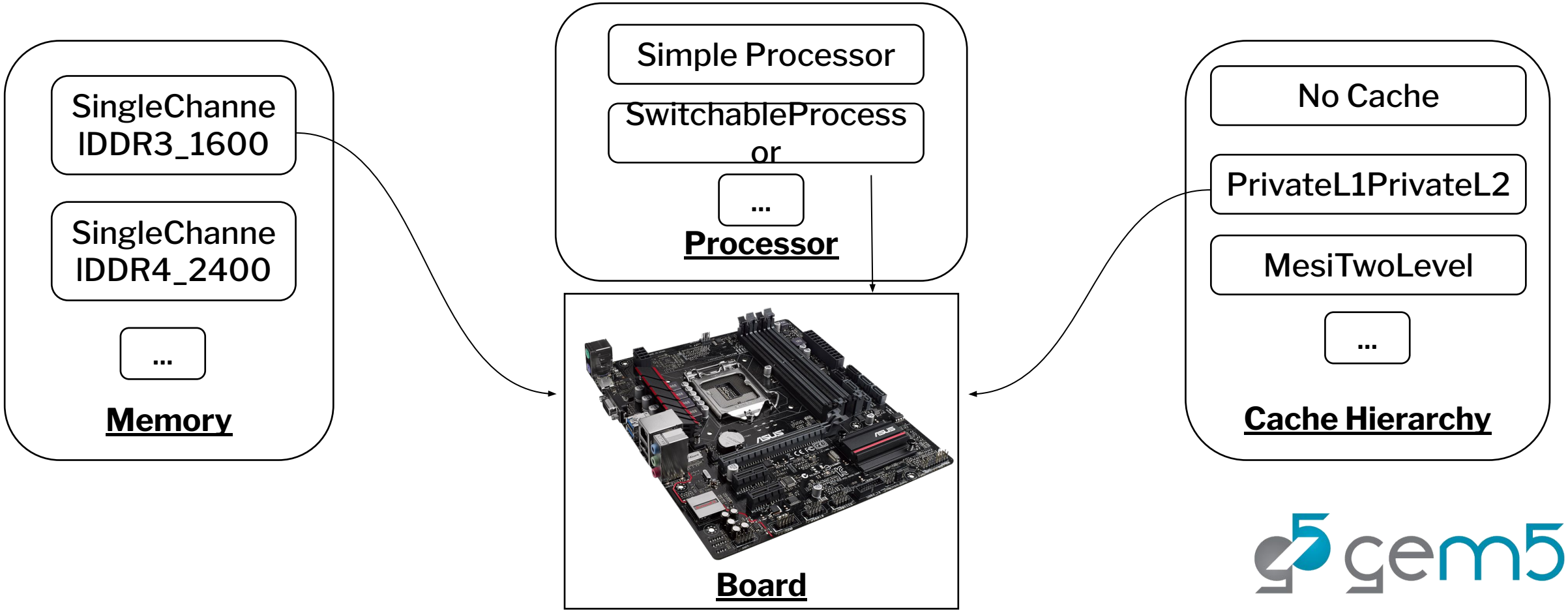
Presented by Bobby R. Bruce

"HELLO WORLD" IN GEM5: PLENTY OF BOILERPLATE



- A single core setup connected directly to main memory, with no cache, requires 36 lines of Python!
- Many hundreds are required for a system capable of booting a modern OS.
- Unsupported scripts and examples are circulated in the community as many configurations do not vary between simulations.

SOLUTION: GEM5 COMPONENTS



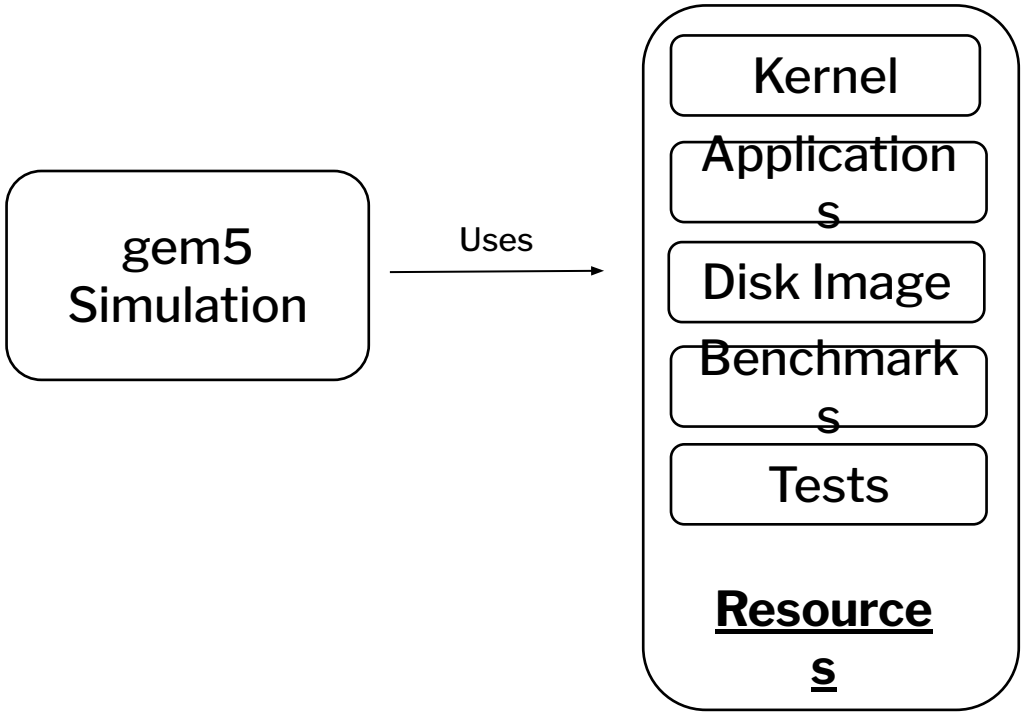
GEM5 COMPONENTS

gem5components.py

gem5components.py 〉 No Selection

```python
from gem5.components.boards.x86_board import X86Board
from gem5.components.memory.single_channel import SingleChannelDDR3_1600
from gem5.components.processors.simple_processor import SimpleProcessor
from gem5.components.cachehierarchies.classic.private_l1_cache_hierarchy import (
    PrivateL1CacheHierarchy,
)
from gem5.processors.cpu_types import CPUTypes

memory = SingleChannelDDR3_1600(size="3GB")
cache_hierarchy = PrivateL1CacheHierarchy(l1d_size="16kB", l1i_size="16kB")
processor = SimpleProcessor(cpu_type=CPUTypes.TIMING, num_cores=4)

board = X86Board(
    clk_freq="3GHz",
    processor=processor,
    memory=memory,
    cache_hierarchy=cache_hierarchy,
)

board.connect_things()
```

AND, GEM5 RESOURCES!



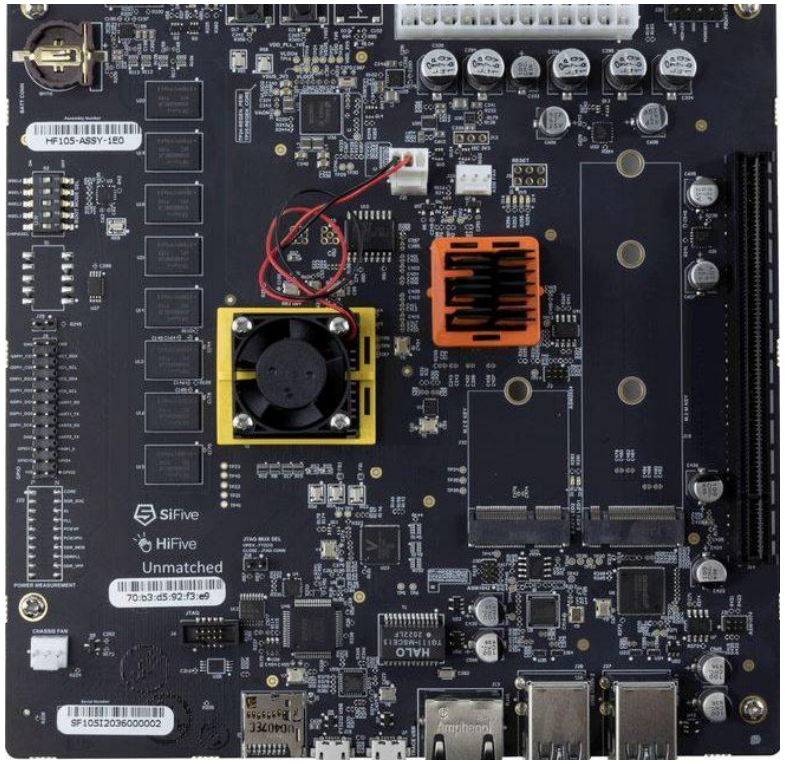
Uses

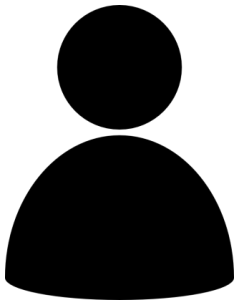
resources.py

```python
from gem5.components.board.x86_board import X86Board
from gem5.resource import Resource
from gem5.simulate import simulate

board = X86Board(...)

board.set_workload(
    kernel = Resource("x86-linux-kernel-5.4.49"),
    disk_image = Resource("x86-ubuntu-img"),
)

simulate(board)
```

- gem5 resources contains pre-built resources for gem5 simulations.
- They may be automatically obtained via configuration scripts.

COMING SOON! "KNOWN GOOD CONFIGURATIONS"





Known Good Configurations

sifive_board.py

sifive_board.py 〉 No Selection

```python
from gem5.known_good.unmatched_sifive import SiFive
from gem5.simulate import simulate
from gem5.resource import Resource

board = SiFive()

board.set_workload(
    Resource("riscv-ubuntu-boot")
)

simulate(board)
```

gem5