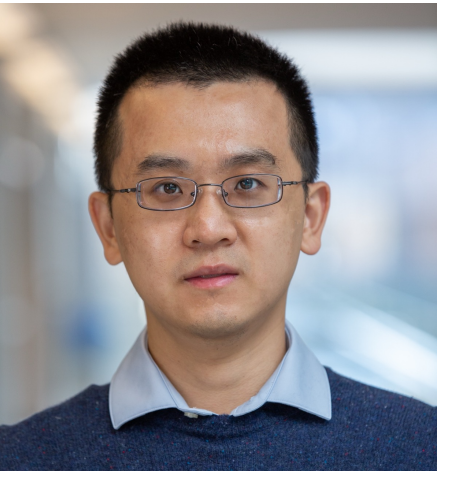
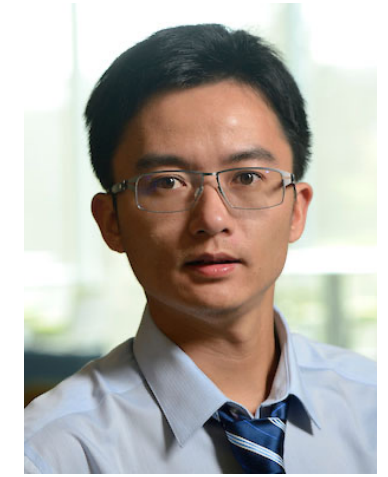
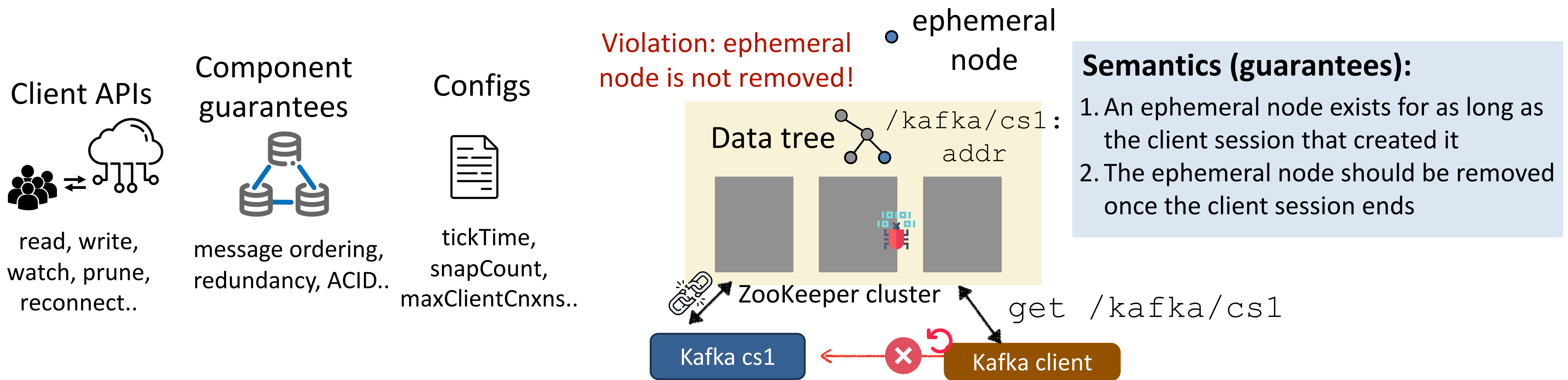


Synthesizing Semantic Checkers for Runtime Verification of Production Distributed Systems



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Challenge:

- Distributed systems have rich features but can silently violate the guarantees they provide
- Runtime verification is promising but bottlenecked by the lack of comprehensive semantic checkers
- Difficult and tedious to manually write checkers

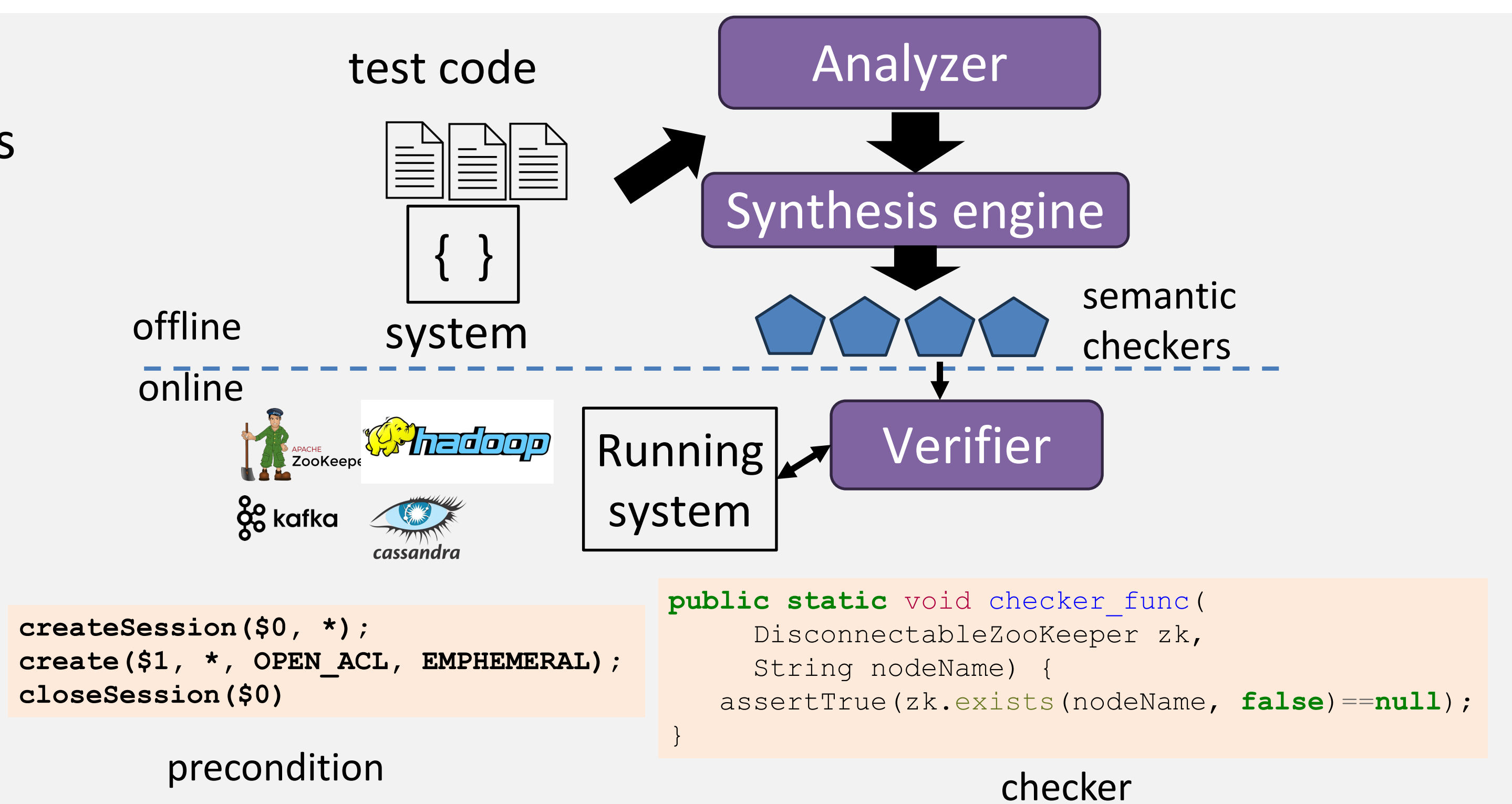
Scientific Impact:

- New static and dynamic analysis techniques for distributed system code
- New domain-specific language for expressing semantic checkers
- New synthesis algorithms for checker generation

Solution:

- Automatically generate semantic checkers
- Use program synthesis techniques
- Leverage existing test cases

```
public void testSessionTimeout() {
    DisconnectableZooKeeper zk = createClient(TIMEOUT);
    zk.create("/stest", new byte[0], OPEN_ACL, EPHEMERAL);
    zk.close();
    zk.disconnect();
    Thread.sleep(TIMEOUT*2);
    zk = createClient(TIMEOUT);
    Assert.assertTrue(zk.exists("/stest", false) == null);
    zk.close();
}
```



Broader Impact:

- Provide strong resilience for large-scale distributed systems
- Reduce impact of silent failures in critical services for users and society

Broader Impact:

- Engage undergraduate students in research
- Mentor students to develop interdisciplinary skills in distributed systems and FM
- Develop curriculum materials for program synthesis and systems courses

Broader Impact:

- Interact with developers in open-source community
- Open source toolchains
- Collaborate with cloud service companies

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