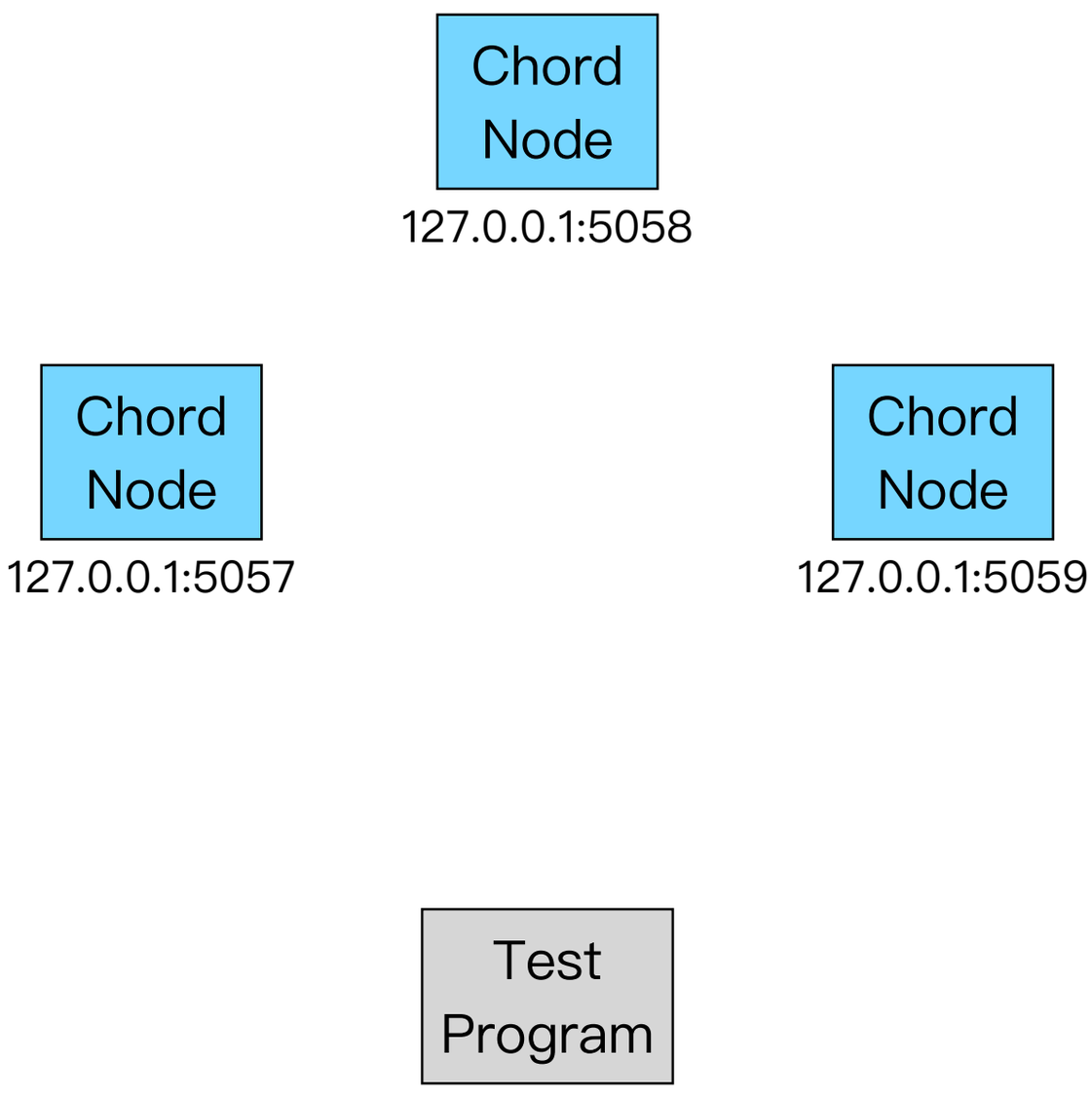
Midterm Project – Chord
Part 1: DHT Layer Implementation
Practices for Distributed Systems and Cloud Application Development

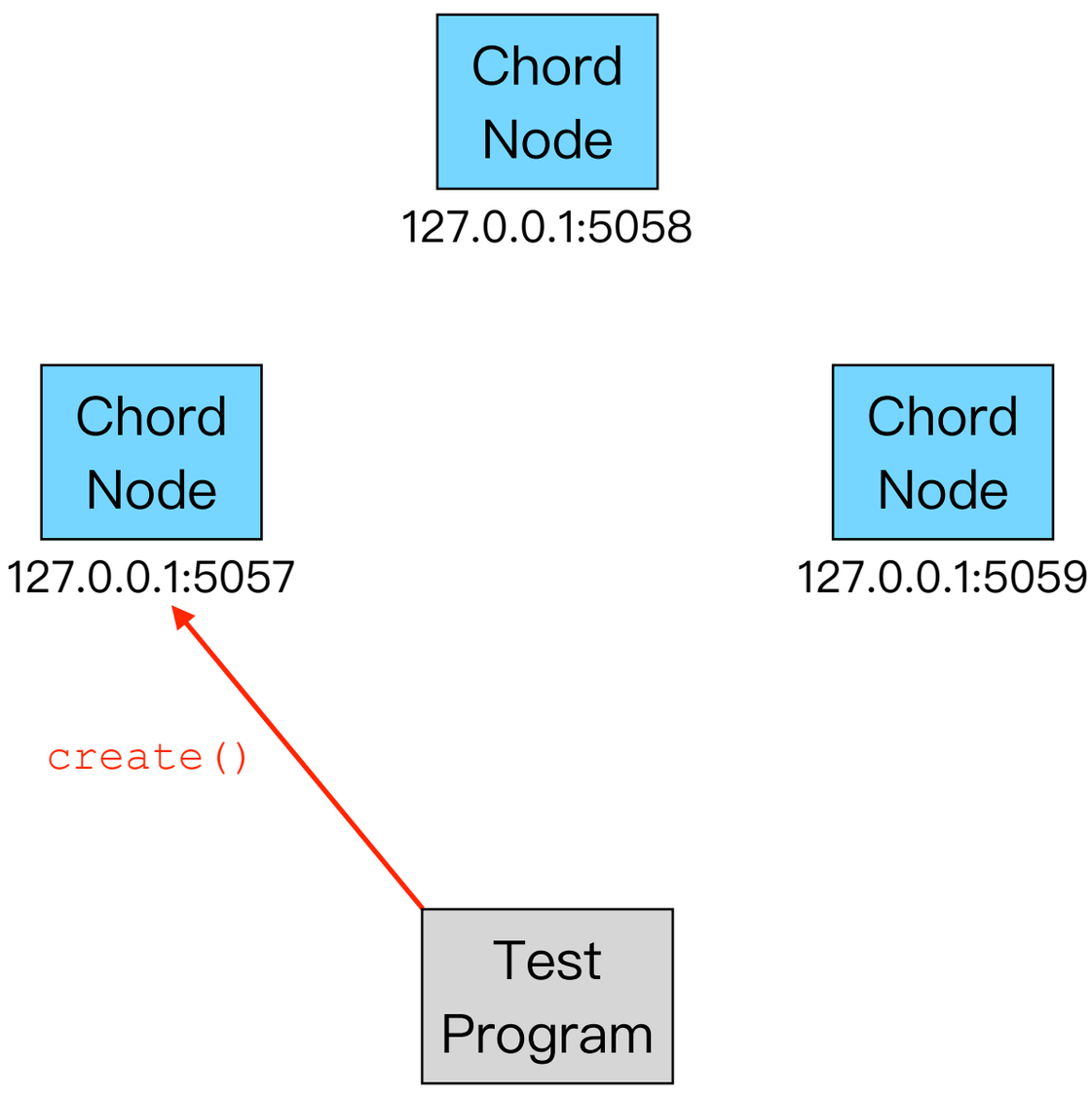
Goal

- Implement Chord node in C++ using rpclib
- Invoke the RPC methods of Chord nodes using Python MessagePack RPC
- Test your implementation locally

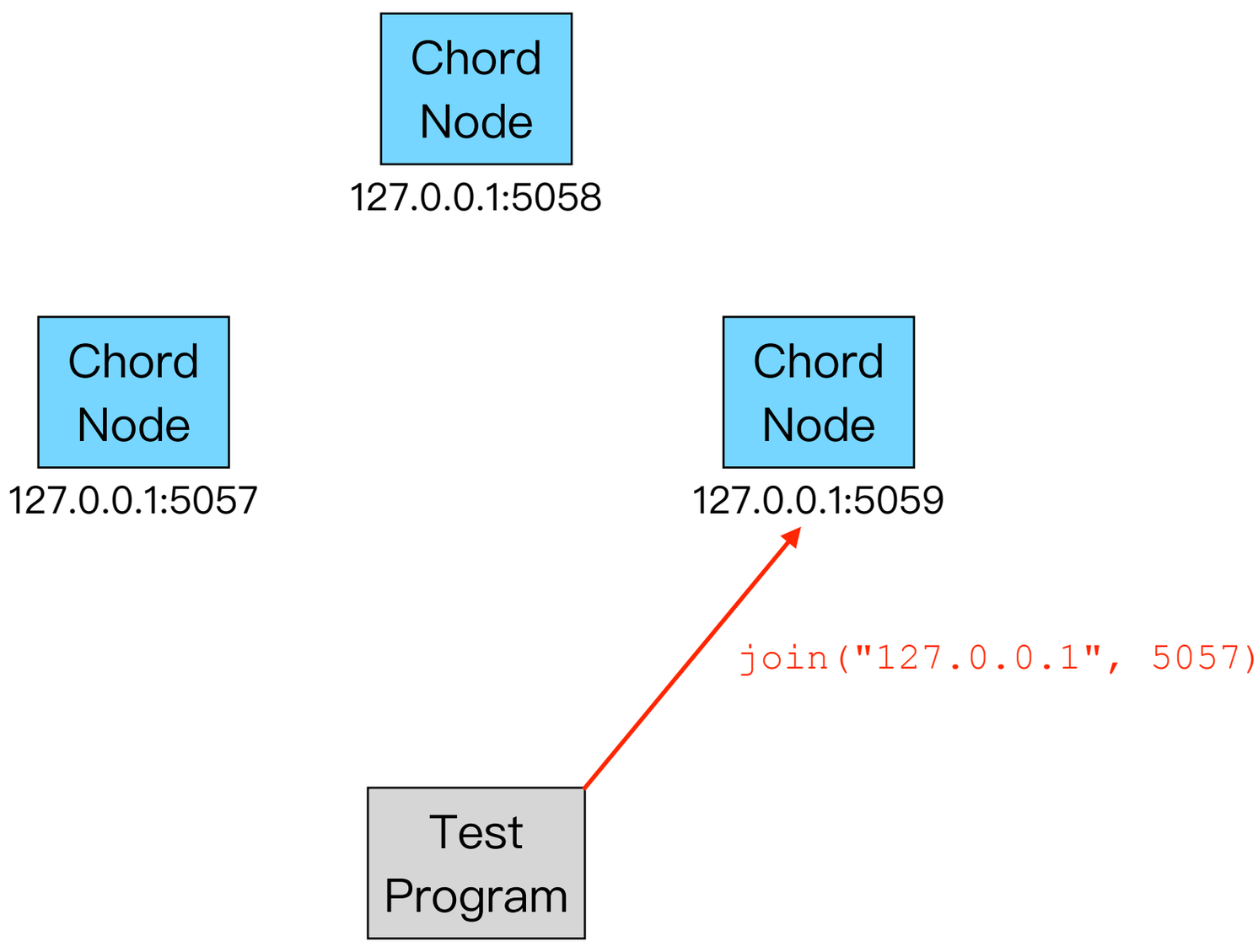
Chord System



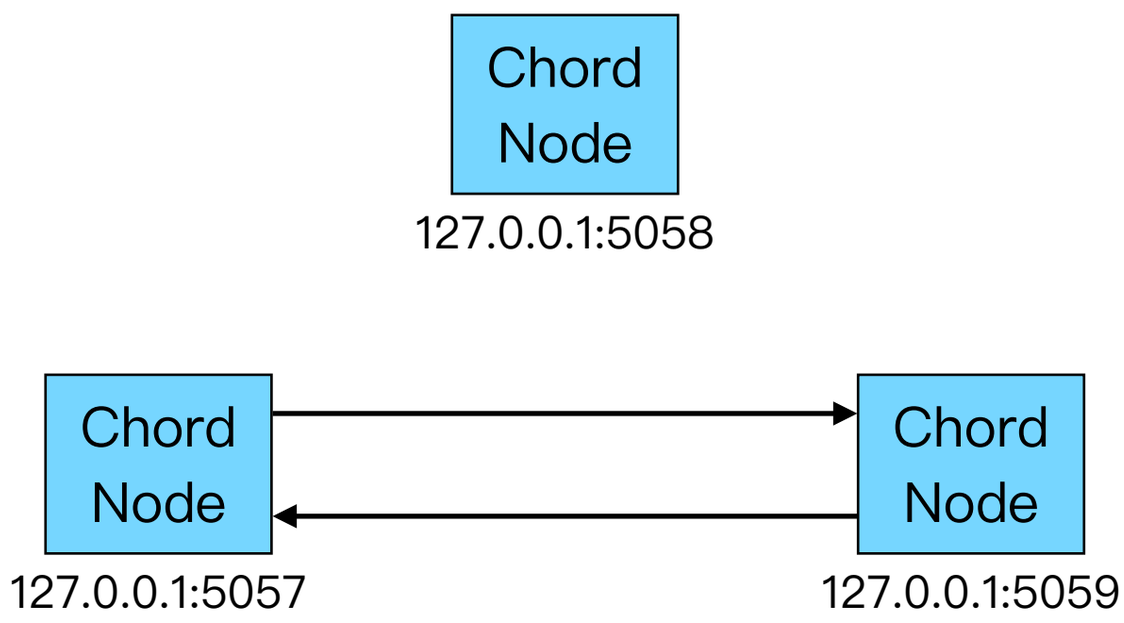
Chord System



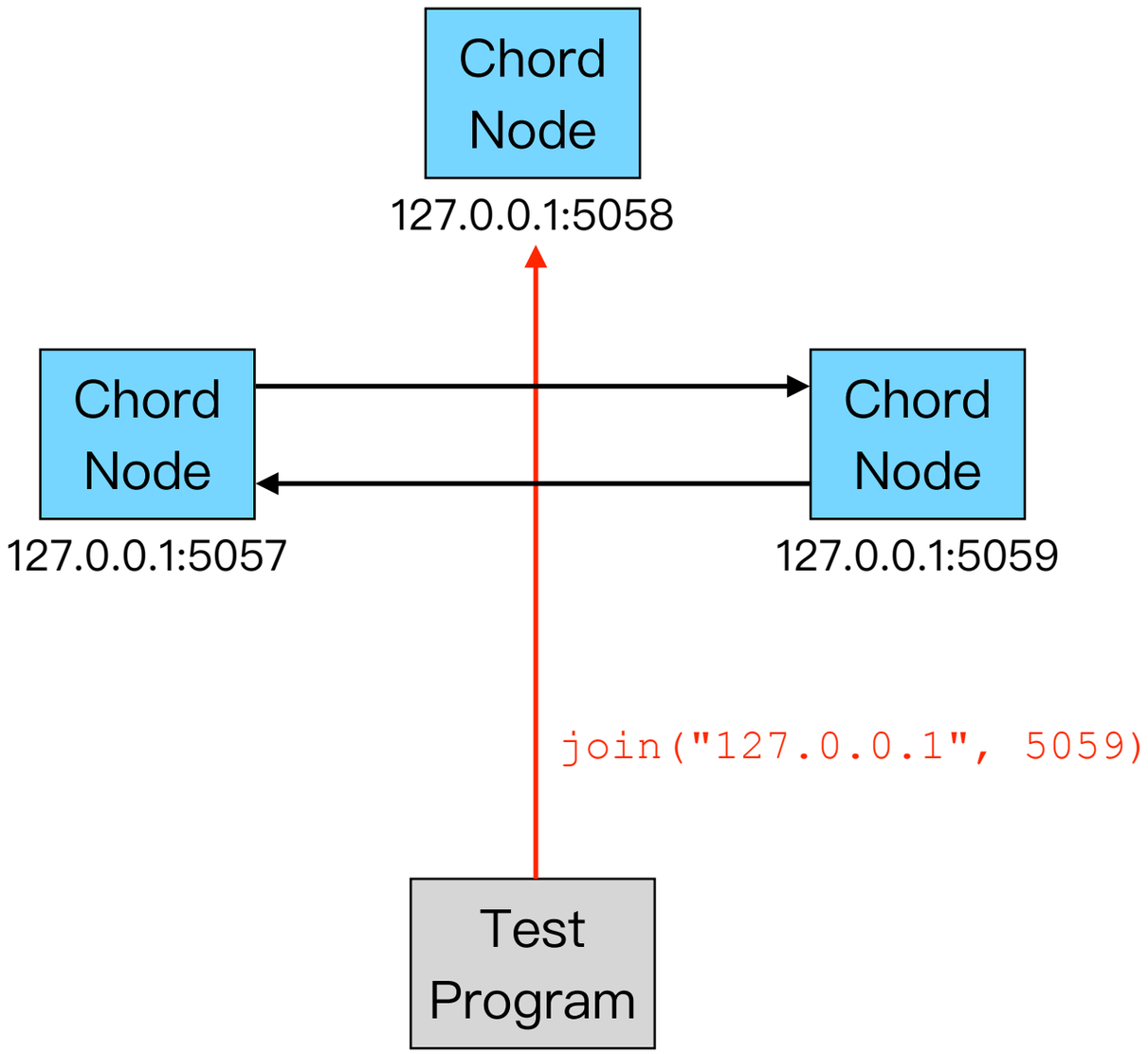
Chord System



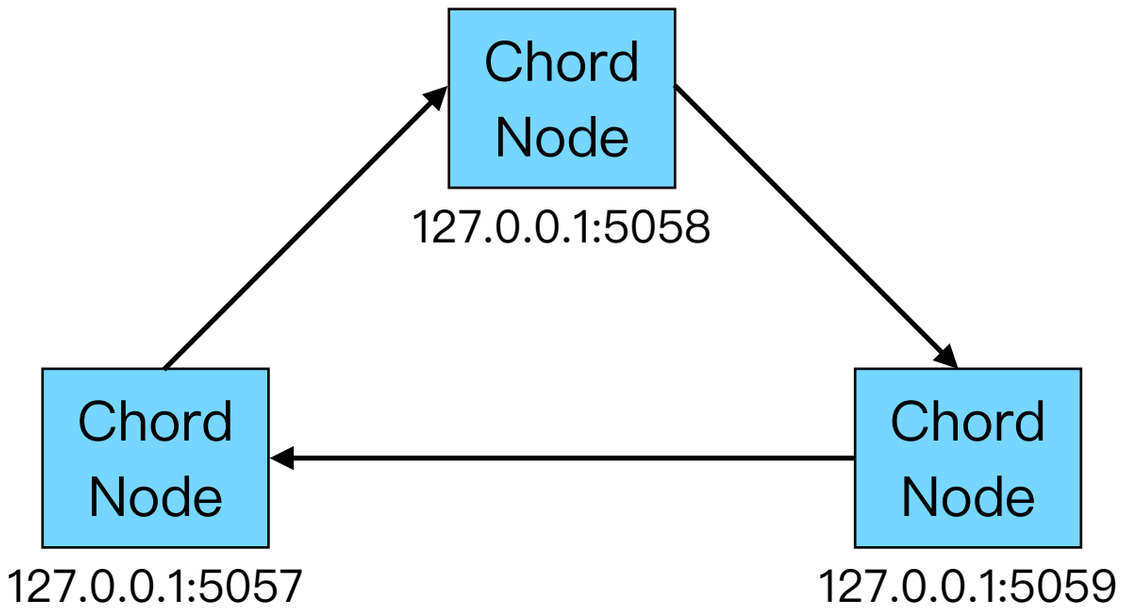
Chord System



Chord System

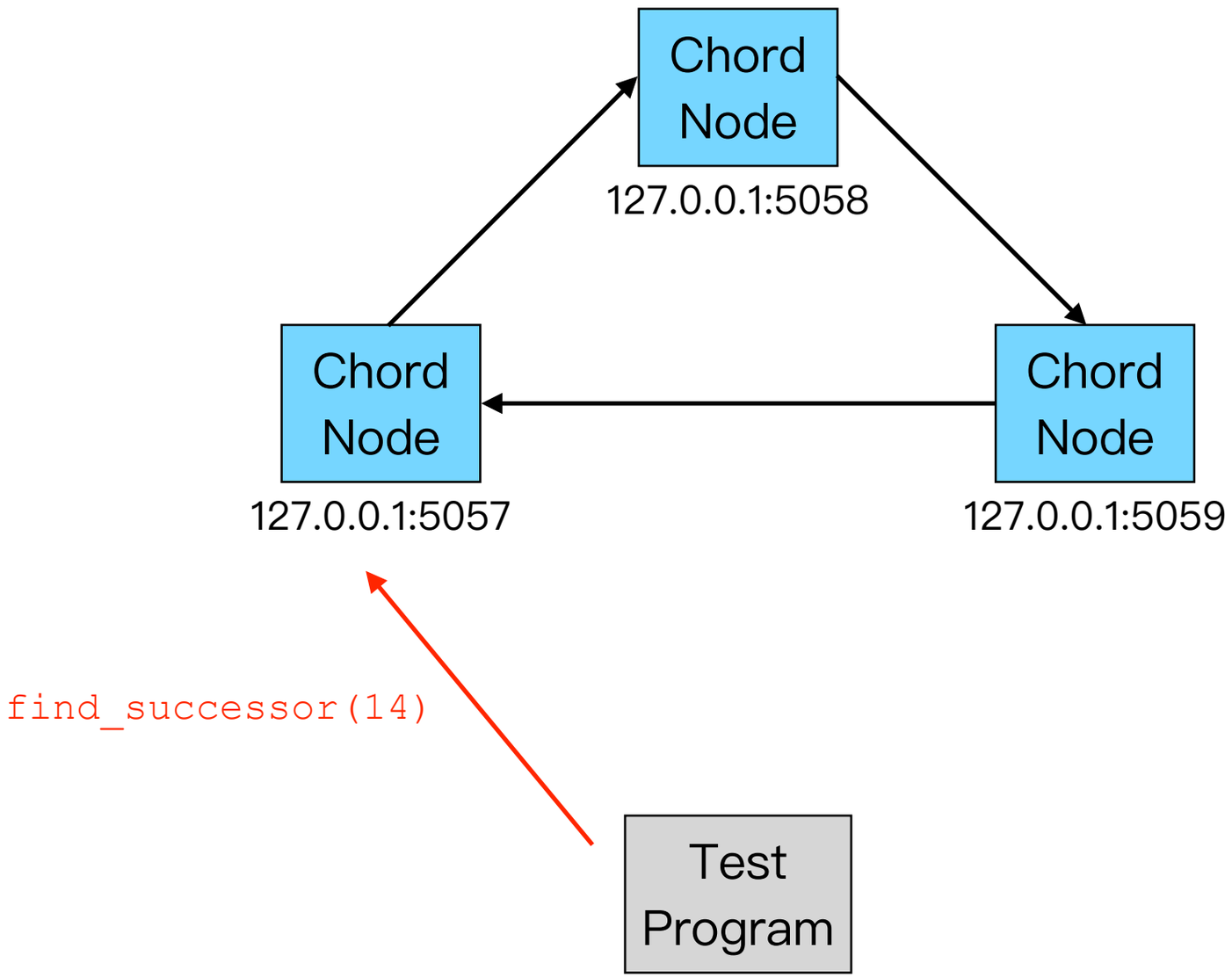


Chord System

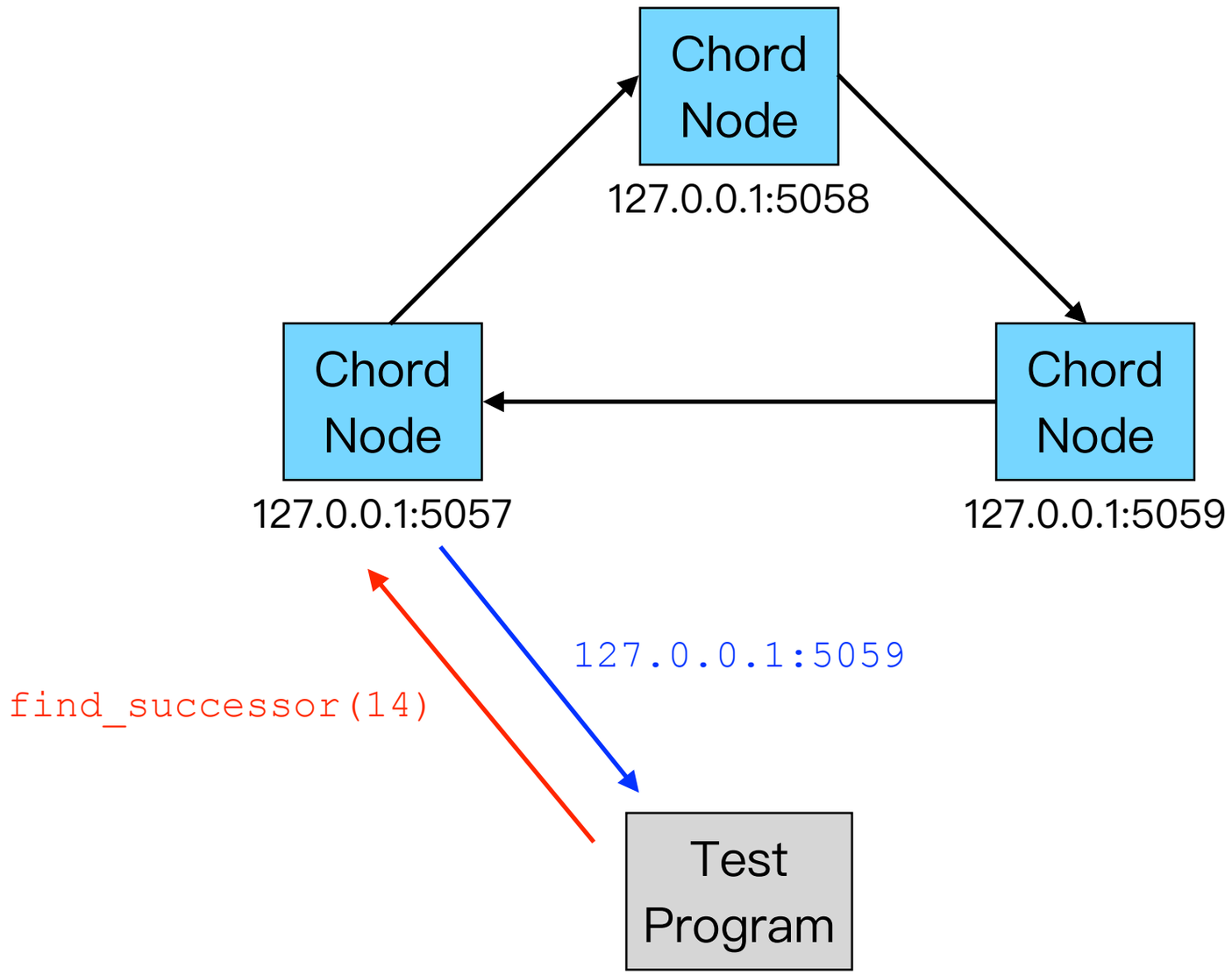


Test
Program

Chord System



Chord System



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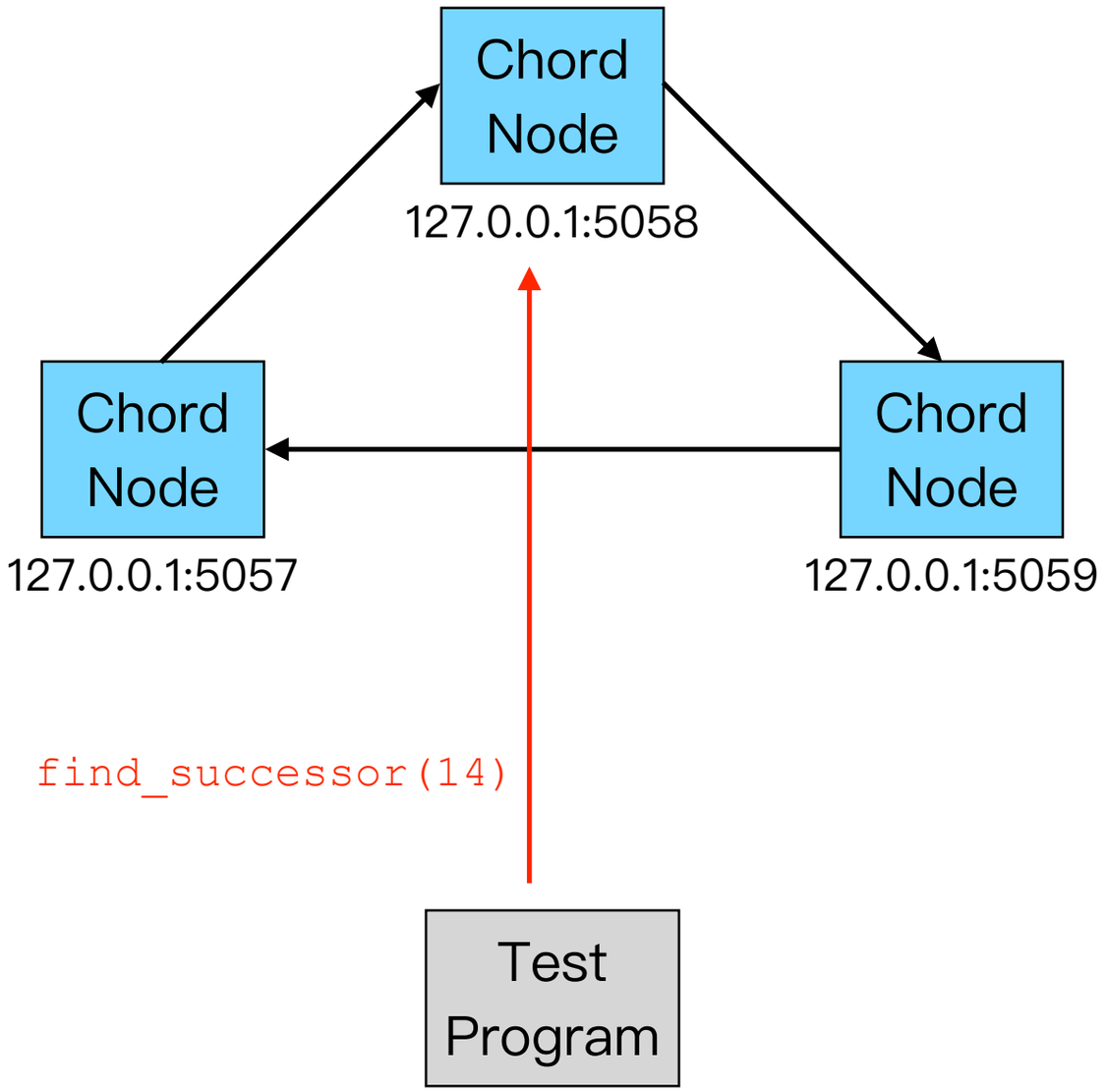
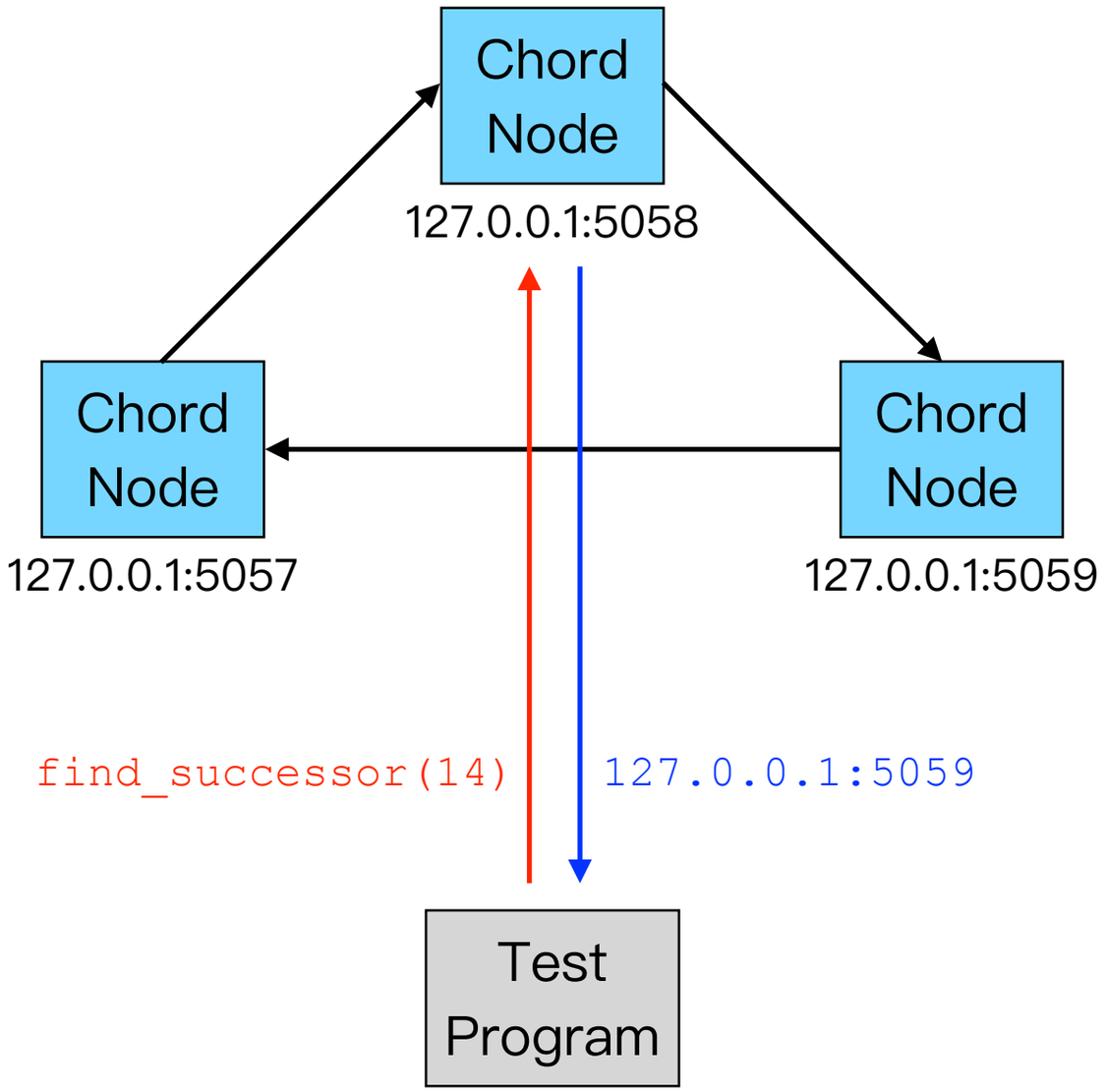
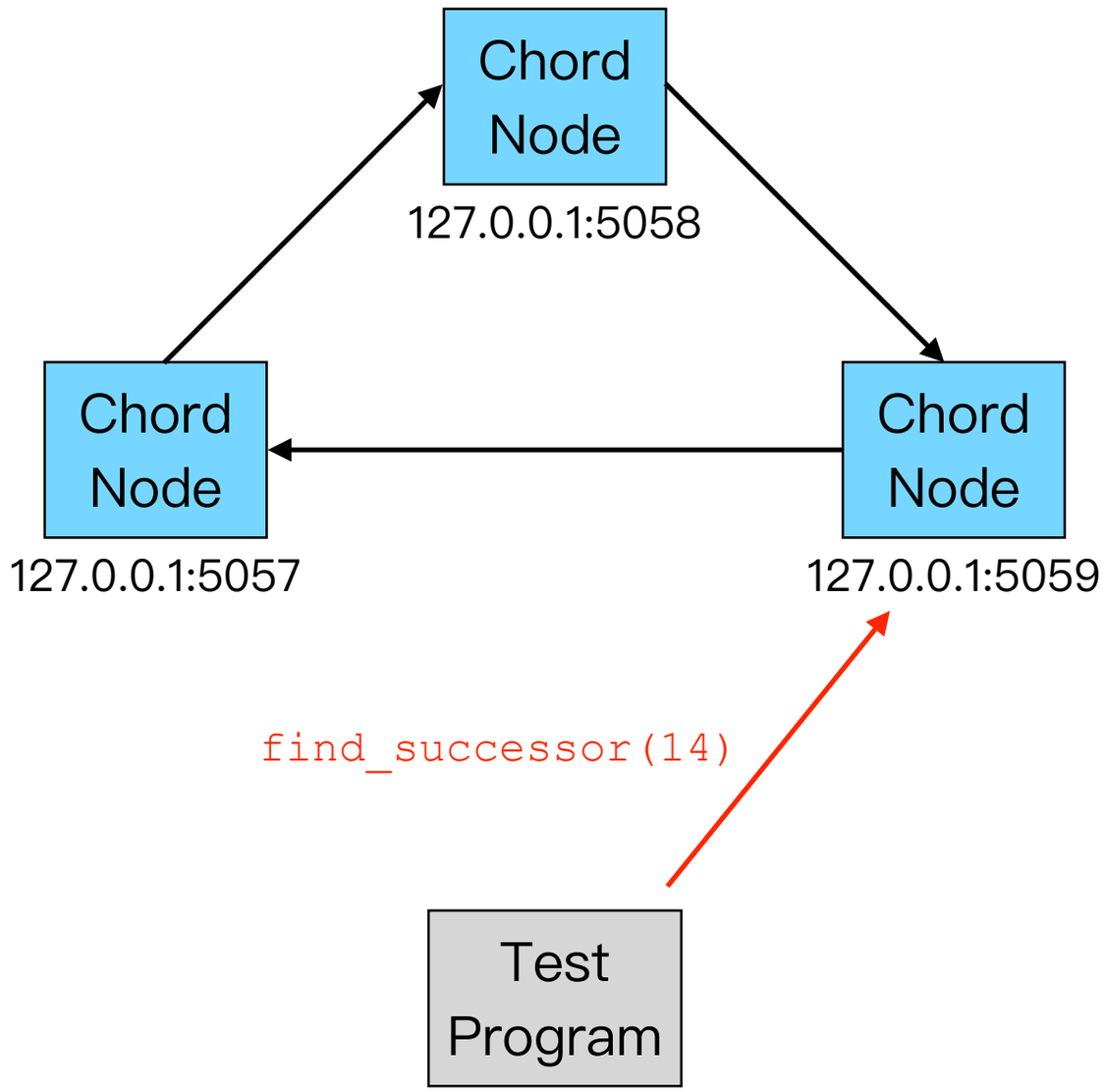


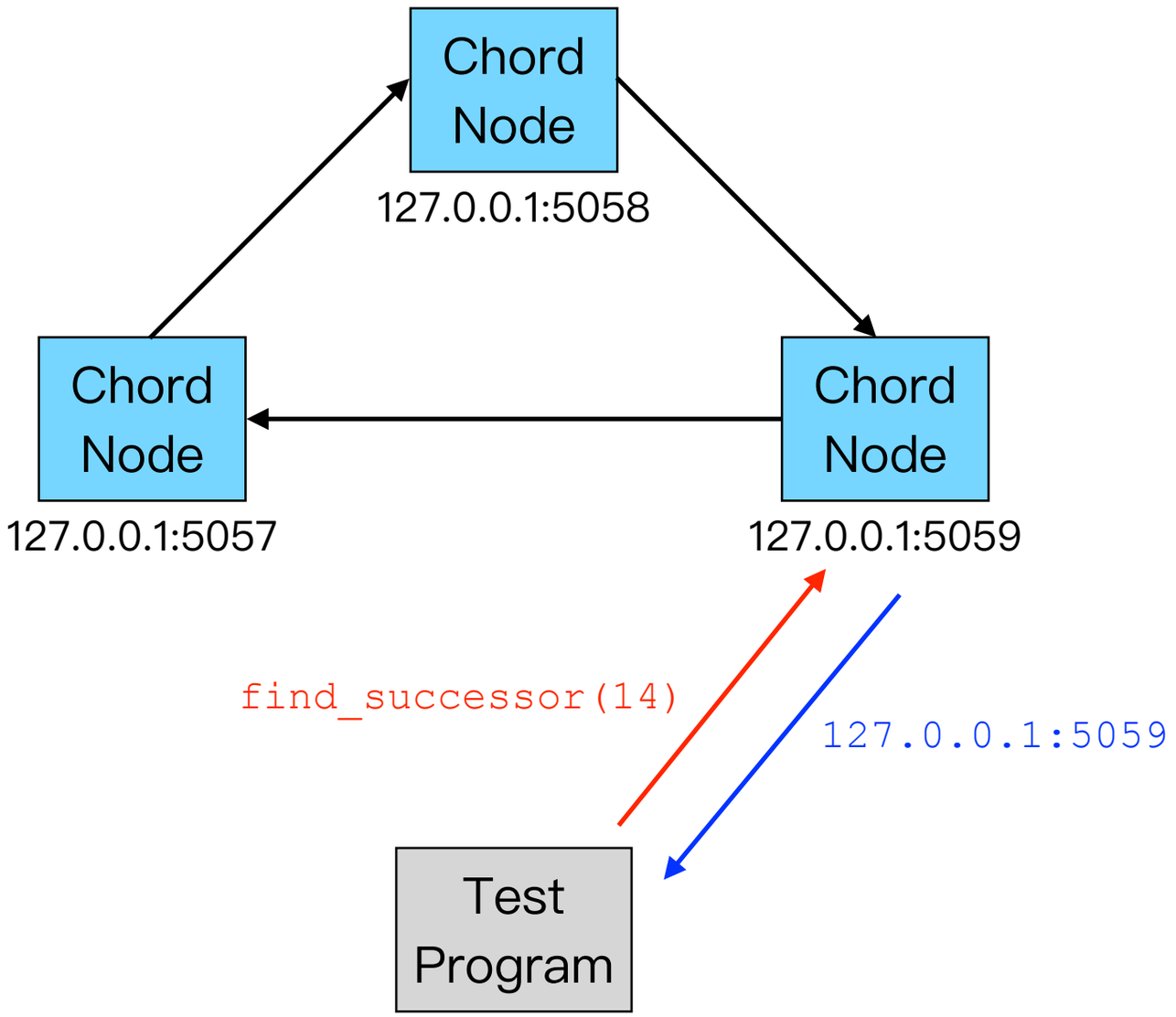
Chord System



Chord System



Chord System



Chord System

```cpp
// Implementation (C++)

Node get_info() { return self; }

void create() {
  predecessor.ip = "";
  successor = self;
}

void join(Node n) {
  predecessor.ip = "";
  rpc::client client(n.ip, n.port);
  successor = client.call("find_successor", self.id).as<Node>();
}
```

```python
# Test script (Python)

client_1 = new_client("127.0.0.1", 5057)
client_2 = new_client("127.0.0.1", 5058)

print(client_1.call("get_info"))
print(client_2.call("get_info"))

client_1.call("create")
client_2.call("join", client_1.call("get_info"))
```

Grading Policy

- Correctness: 40%
- Message Complexity: 30%
- Fault Tolerance: 30%

Correctness (40%)

- We will test your Chord system by calling the "get_info","create", "join", and "find_successor" RPCs

- Your Chord system must always return the correct answer when the "find_successor" RPC is called

Correctness (40%)

```
client_0.call("create")

client_2.call("join", client_0.call("get_info"))
client_1.call("join", client_2.call("get_info"))
client_4.call("join", client_1.call("get_info"))
client_5.call("join", client_0.call("get_info"))
client_3.call("join", client_4.call("get_info"))
# ...

ans = client_0.call("find_successor", 1234567)
# check ans
ans = client_1.call("find_successor", 1234567890)
# check ans
# ...
```

Message Complexity (30%)

- Message complexity when processing "find_successor" requests

- Message complexity when no external requests

Fault Tolerance (30%)

- We will test your Chord system by calling the "get_info","create", "join", "find_successor" and "kill" RPCs
    - Killing one node at once (15%)
    - Killing two nodes at once (15%)

Grading Policy

- If your Chord system fails to meet **correctness**, you will not receive credit for the subsequent parts