


作业展示

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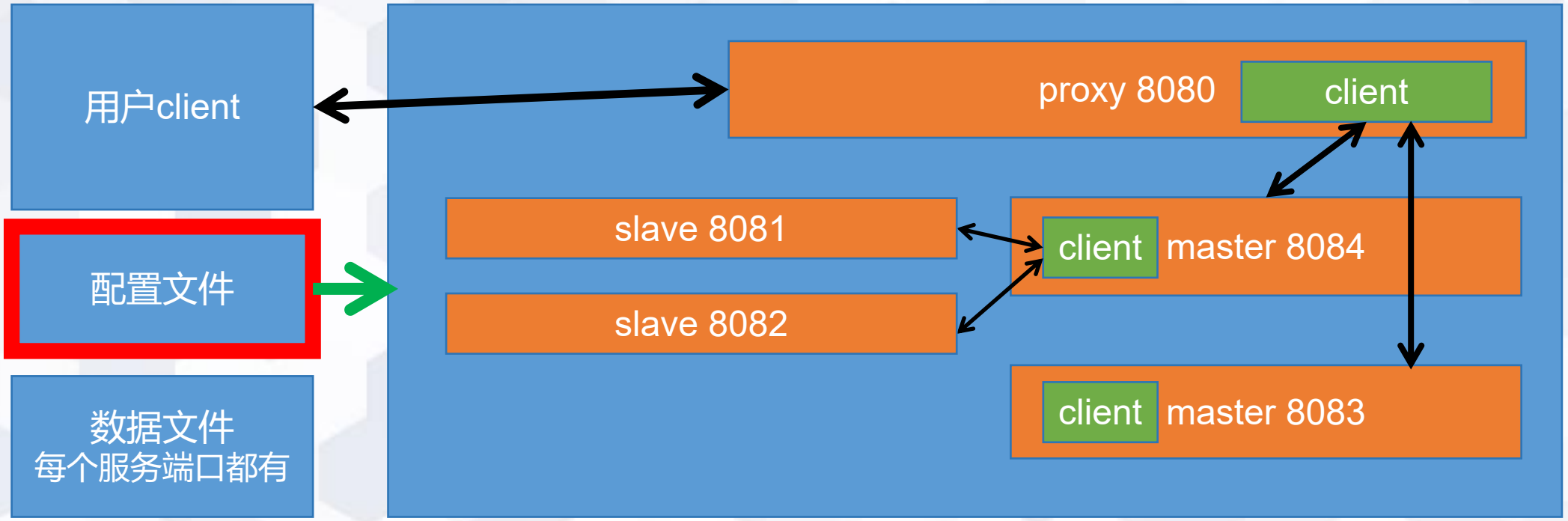
原理展示


用户client
配置文件
数据文件
每个服务端口都有
proxy 8080
client
slave 8081
slave 8082
client
master 8084
client
master 8083



配置文件Server.json

[["127.0.0.1:8080",["y"],["y"]],["127.0.0.1:8081",["n","127.0.0.1:8080"],["n","127.0.0.1:8084"]],["127.0.0.1:8082",["n","127.0.0.1:8080"],["n","127.0.0.1:8084"]],["127.0.0.1:8083",["n","127.0.0.1:8080"],["y"]],["127.0.0.1:8084",["n","127.0.0.1:8080"],["y","127.0.0.1:8081","127.0.0.1:8082"]]]

```rust
let infos: Vec<(String, Vec<String>, Vec<String>)> = vec![
    ("127.0.0.1:8080".to_string(),vec!["y".to_string()],vec!["y".to_string()]),
    ("127.0.0.1:8081".to_string(),vec!["n".to_string(),"127.0.0.1:8080".to_string()],vec!["n".to_string(), "127.0.0.1:8084".to_string()]),
    ("127.0.0.1:8082".to_string(),vec!["n".to_string(),"127.0.0.1:8080".to_string()],vec!["n".to_string(), "127.0.0.1:8084".to_string()]),
    ("127.0.0.1:8083".to_string(),vec!["n".to_string(),"127.0.0.1:8080".to_string()],vec!["y".to_string()]),
    ("127.0.0.1:8084".to_string(),vec!["n".to_string(),"127.0.0.1:8080".to_string()],
    vec!["y".to_string(), "127.0.0.1:8081".to_string(), "127.0.0.1:8082".to_string()]),
];
```


Struct S

```rust
impl Serialize for DB {
    fn serialize<S>(&self, serializer: S) -> Result<S::Ok, S::Error>
    where
        S: serde::Serializer,
    {
        self.kvs.serialize(serializer)
    }
}

impl<'de> Deserialize<'de> for DB {
    fn deserialize<D>(deserializer: D) -> Result<Self, D::Error>
    where
        D: serde::Deserializer<'de>,
    {
        let kvs: HashMap<String, String> = HashMap::deserialize(deserializer)?;
        core::result::Result::Ok(DB { kvs })
    }
}
```

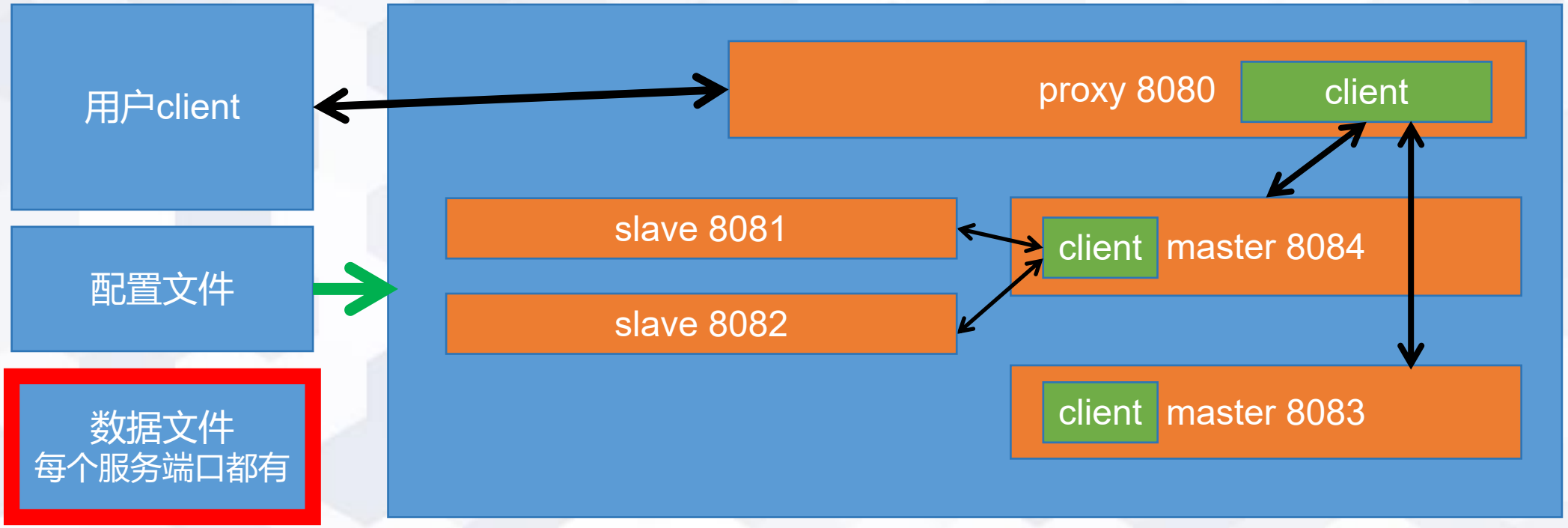
2 implementations

```rust
pub struct Tm{
    kts: HashMap<String, (u128,u128)>,
}
```

4 implementations

```rust
pub struct S{
    contents:RwLock<RefCell<DB>>,
    times:RwLock<RefCell<Tm>>,
    port: RwLock<RefCell<String>>,
    proxy: RwLock<RefCell<Vec<String>>>,
    master: RwLock<RefCell<Vec<String>>>,
}
```

AOF


用户client
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每个服务端口都有
proxy 8080
client
slave 8081
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client
master 8084
client
master 8083



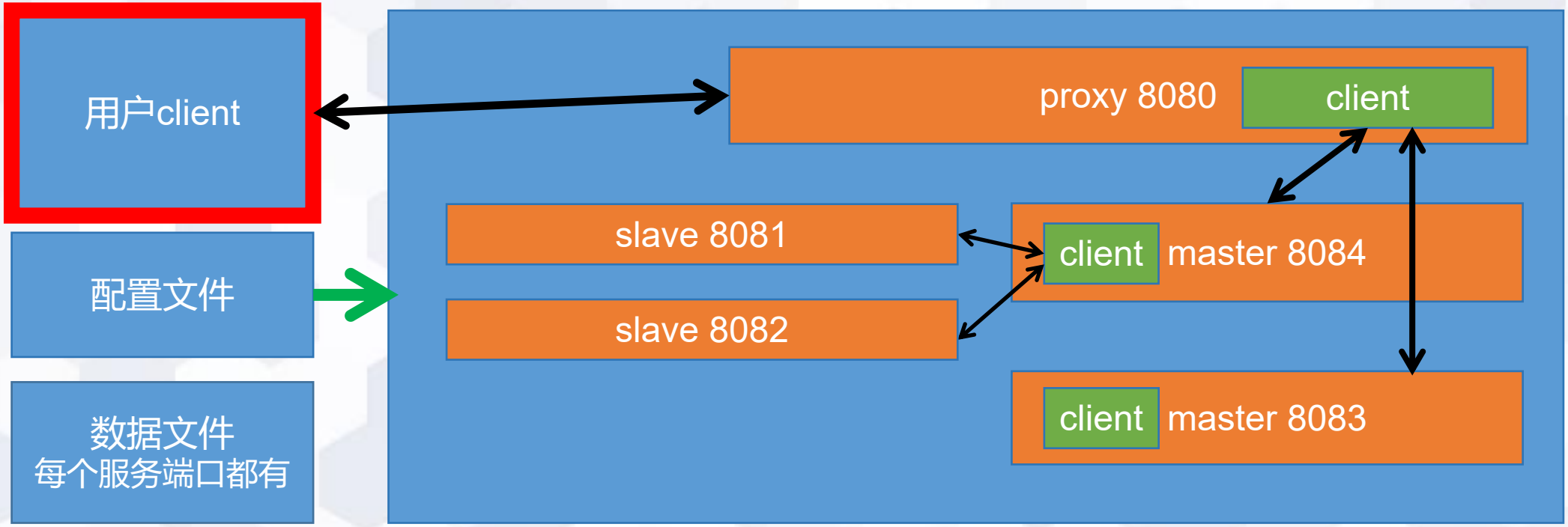
AOF

```rust
impl S{
    pub fn store(&self) -> Result<(), volo_thrift::AnyhowError> {
        // 获取内容锁
        let contents: RwLockReadGuard<'_, RefCell<…>> = self.contents.read().unwrap();
        let times: RwLockReadGuard<'_, RefCell<…>> = self.times.read().unwrap();
        let port: RwLockReadGuard<'_, RefCell<…>> = self.port.read().unwrap();
        let proxy: RwLockReadGuard<'_, RefCell<…>> = self.proxy.read().unwrap();
        let master: RwLockReadGuard<'_, RefCell<…>> = self.master.read().unwrap();

        // 序列化内容
        let myport: String = port.borrow().clone();
        let db_json: String = serde_json::to_string(&*contents.borrow())?;
        let tm_json: String = serde_json::to_string(&*times.borrow())?;
        let port_json: String = serde_json::to_string(&*port.borrow())?;
        let proxy_json: String = serde_json::to_string(&*proxy.borrow())?;
        let master_json: String = serde_json::to_string(&*master.borrow())?;
        //println!("store{}", myport);

        // 写入文件
        //println!("1111111");
        let mut file: File = File::create(path: "data".to_string()+&myport+".json")?;
        file.write_all(buf: db_json.as_bytes())?;
        file.write_all(buf: b"\n")?; // 添加换行符以分隔内容
        file.write_all(buf: tm_json.as_bytes())?;
        file.write_all(buf: b"\n")?; // 添加换行符以分隔内容
        file.write_all(buf: port_json.as_bytes())?;
        file.write_all(buf: b"\n")?; // 添加换行符以分隔内容
        file.write_all(buf: proxy_json.as_bytes())?;
        file.write_all(buf: b"\n")?; // 添加换行符以分隔内容
        file.write_all(buf: master_json.as_bytes())?;
        Ok(())
    } fn store
```

```rust
pub fn new(port: String, proxy:Vec<String>, master:Vec<String>) -> Self {
    let db: DB;
    let tm: Tm;
    let myport: String;
    let myproxy: Vec<String>;
    let mymaster: Vec<String>;

    let path: String = "data".to_string()+&port+".json";
    if Path::new(&path).exists() {
        println!("A database is created from the file");
        // 如果文件存在，则从文件中导入内容
        let mut file: File = File::open(&path).expect(msg: "Error (1) in reading the file");
        let mut file_contents: String = String::new();
        file.read_to_string(buf: &mut file_contents).expect(msg: "Error (2) in reading the file");

        let lines: Vec<&str> = file_contents.lines().collect();

        // 反序列化内容
        db = serde_json::from_str(lines[0]).expect(msg: "Error (3) in reading the file");
        tm = serde_json::from_str(lines[1]).expect(msg: "Error (4) in reading the file");
        myport = serde_json::from_str(lines[2]).expect(msg: "Error (5) in reading the file");
        myproxy = serde_json::from_str(lines[3]).expect(msg: "Error (6) in reading the file");
        mymaster = serde_json::from_str(lines[4]).expect(msg: "Error (7) in reading the file");
    } else {
        println!("A new database is created");
        // 如果文件不存在，则创建新的结构体
        db = DB { kvs: HashMap::new() };
        tm = Tm { kts: HashMap::new() };
        myport = port;
        myproxy = proxy;
        mymaster = master;
    }
    // 创建 S 结构体并返回
    S {
        contents: RwLock::new(RefCell::new(db)),
        times: RwLock::new(RefCell::new(tm)),
        port: RwLock::new(RefCell::new(myport)),
        proxy: RwLock::new(RefCell::new(myproxy)),
        master: RwLock::new(RefCell::new(mymaster)),
    }
} fn new
```

主从&cluster

以set 127.0.0.1:8084 2 4为例



主从&cluster

以set 127.0.0.1:8084 2 4为例

用户client

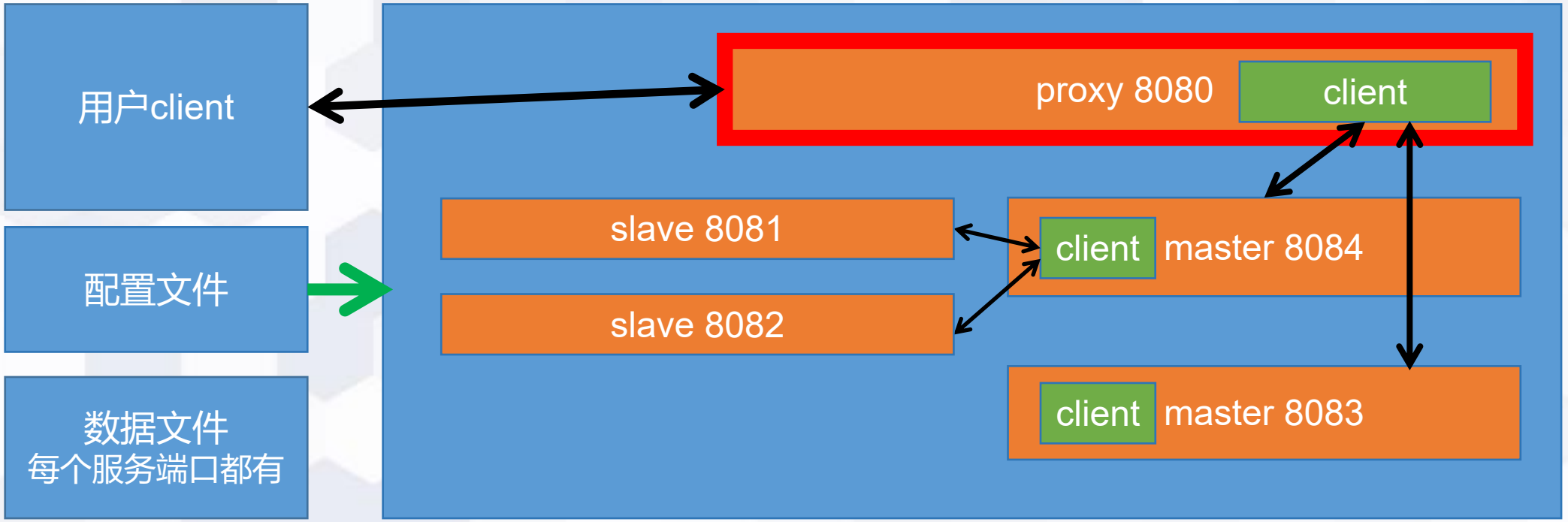
```
[volo::main]
▶ Run | Debug
sync fn main() {
    let args: Vec<String> = env::args().collect();
    unsafe { ADDR_STR = args[1].clone(); }
    tracing_subscriber::fmt::init();
    loop{
        print!("redis> ");
        let mut input: String= String::new();
        io::stdout().flush().expect(msg: "无法刷新标准输出");
        io::stdin().read_line(buf: &mut input).expect(msg: "读取失败! ");
        let words: Vec<&str> = input.split_whitespace().collect();
        let input: Vec<String> = words.iter().map(|&s: &str| s.to_string()).collect();
        //println!("单词: {:?}", input);
        let mut req: GetItemRequest = volo_gen::volo::example::GetItemRequest { op:" ".into(), key:" ".into(), value:" ".into(), life:0i32, otherport:" ".into()};
        if words.len() == 0{
            println!("输入为空，请重新输入: ");
            continue;
        }
```

```
    else if input.len() == 4 {
        req.op = "setport".into();
        req.otherport = input[1].clone().into();
        req.key = input[2].clone().into();
        req.value = input[3].clone().into();
    }
    let resp: Result<GetItemResponse, ResponseError<…>> = CLIENT.get_item(req).await;
```

主从&cluster

以set 127.0.0.1:8084 2 4为例

redis proxy





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以set 127.0.0.1:8084 2 4为例

redis proxy server

```
"setport" => {
    //println!("hhhhhhhhhh{}", value);
    resp.op = "setport".into();
    resp.key = key.clone().into();
    resp.value = value.clone().into();
    if self.proxy.read().unwrap().borrow()[0].eq("n"){
        //println!("fffff");
        resp.op = "setportfail".into();
        resp.value = self.proxy.read().unwrap().borrow()[1].clone().into();
        resp.state = false;
        return Ok(resp);
    }
    else{
        resp.state = true;
        //self.store().expect("Error in storing the data");
        let port: String = otherport.clone();
        let key: FastStr = resp.key.clone();
        let value: FastStr = resp.value.clone();
        let (tx: Sender<GetItemResponse>, rx: Receiver<GetItemResponse>) = tokio::sync::oneshot::channel();
        tokio::spawn(future: async move {
            let message: GetItemResponse = other(opstr: "set".to_string(),key: key.into_string(), value: value.into_string(), &port).await;
            //println!("lib{:?}", message);
            if tx.send(message).is_err() {
                println!("Failed to send result to the channel");
            }
        });
        let message: GetItemResponse = rx.await.expect(msg: "Failed to receive result from the channel");
        return Ok(message);
    }
}
```



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以set 127.0.0.1:8084 2 4为例

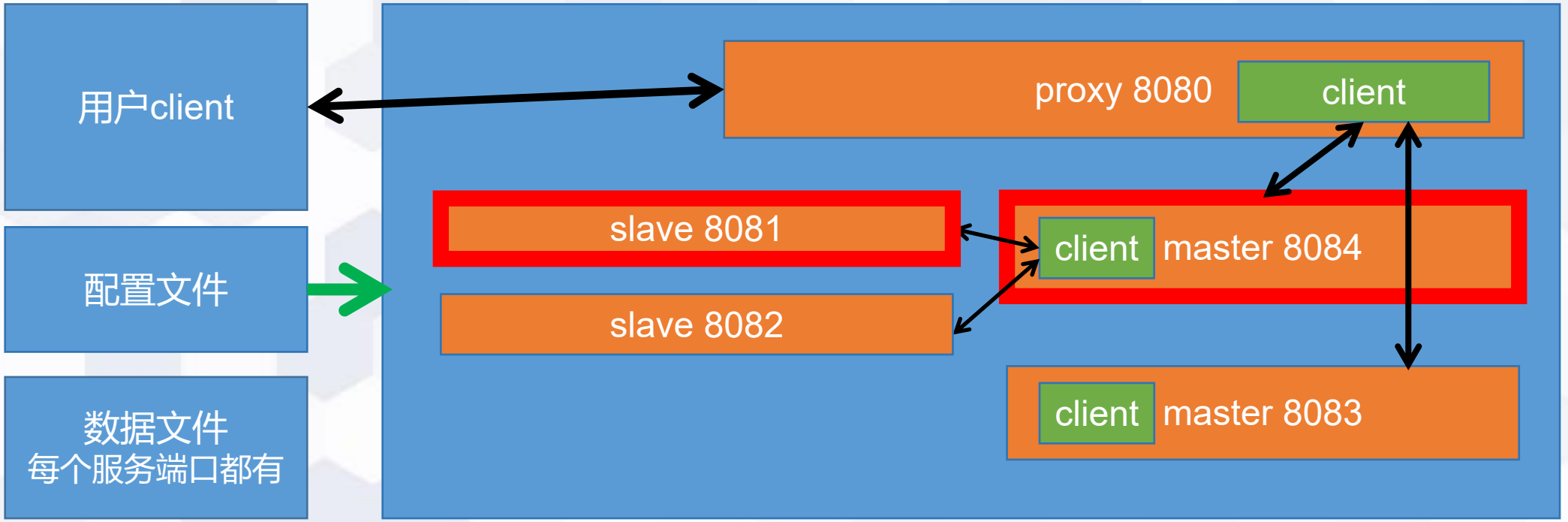
redis proxy client

```rust
use volo_gen::volo::example::GetItemResponse;

async fn other(opstr: String, key:String, value:String, port: &str) -> GetItemResponse{
    unsafe { ADDR_STR = port.to_string();
    }
    let client: volo_gen::volo::example::ItemServiceClient =
    unsafe{
        let addr: SocketAddr = ADDR_STR.parse().unwrap();
        volo_gen::volo::example::ItemServiceClientBuilder::new(service_name: "volo-example") ClientBuilder<Identity, Identity, …, …, …, …, …, …>
        .layer_outer(layer: LogLayer) ClientBuilder<Identity, Stack<…, …>, …, …, …, …, …, …>
        .address(target: addr) ClientBuilder<Identity, Stack<…, …>, …, …, …, …, …, …>
        .build()
    };
    let req: GetItemRequest = volo_gen::volo::example::GetItemRequest { op:opstr.into(), key:key.into(), value:value.into(), life:0i32, otherport:" ".into()};
    //println!("3333");
    client.get_item(req).await.expect(msg: "Error in other()!")
}
```

主从&cluster

以set 127.0.0.1:8084 2 4为例

redis master server



主从&cluster

以set 127.0.0.1:8084 2 4为例

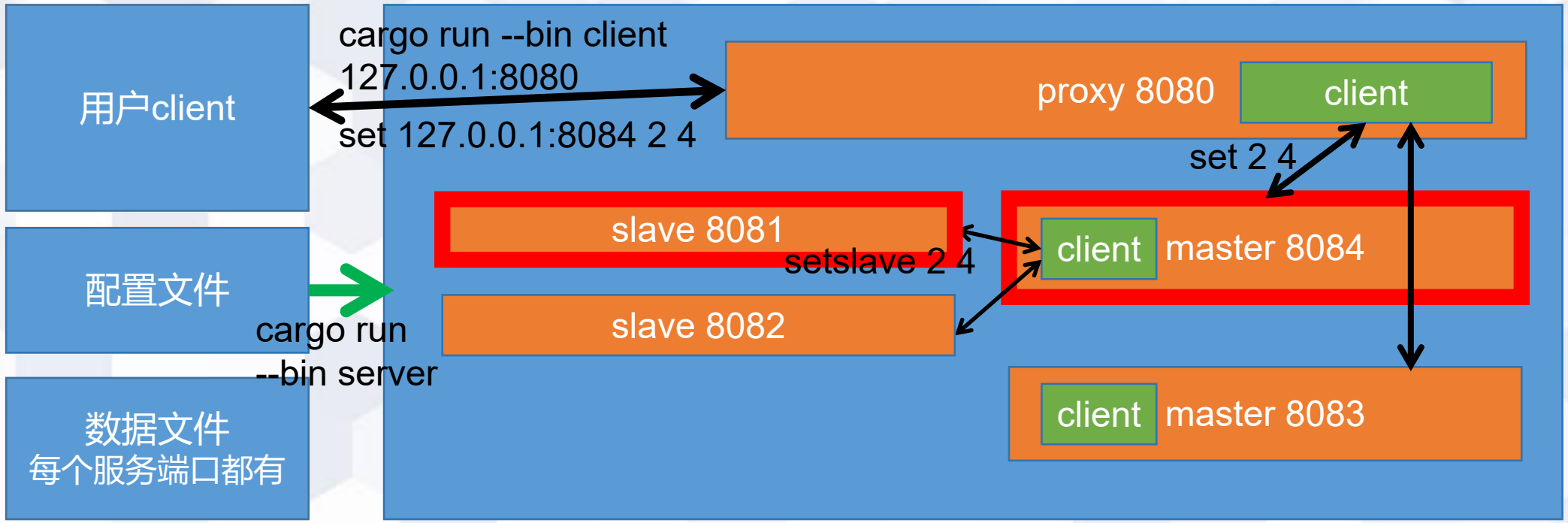
redis master server

```
"set" => {
    //println!("hhhhhhhhhh{}", value);
    resp.op = "set".into();
    resp.key = key.clone().into();
    resp.value = value.clone().into();
    if self.master.read().unwrap().borrow()[0].eq("n"){
        //println!("fffff");
        resp.op = "setslave".into();
        resp.value = self.master.read().unwrap().borrow()[1].clone().into();
        resp.state = false;
        return Ok(resp);
    }
    else if self.contents.read().unwrap().borrow().kvs.contains_key(&key){
        resp.value = self.contents.read().unwrap().borrow().kvs[&key].clone().into();
        resp.state = false;
        return Ok(resp);
    }
    else{
        self.contents.write().unwrap().borrow_mut().kvs.insert(k: key, v: value);
        resp.state = true;
        self.store().expect(msg: "Error in storing the data");
        let ports: Vec<String> = self.master.read().unwrap().borrow().clone();
            for s_ports: &String in ports.iter().skip(1) {
                let port: String = s_ports.clone();
                let key: FastStr = resp.key.clone();
                let value: FastStr = resp.value.clone();
                tokio::spawn(future: async move {
                    slave(opstr: "setslave".to_string(),key: key.into_string(), value: value.into_string(), &port).await;

                });
            }

        return Ok(resp);
    }
}
```

```
"setslave" => {
    //println!("setsla {} {} {}", self.port.read().unwrap().borrow(),key, value);
    self.contents.write().unwrap().borrow_mut().kvs.insert(k: key, v: value);
        resp.state = true;
        self.store().expect(msg: "Error in storing the data");
        return Ok(resp);
```

主从&cluster

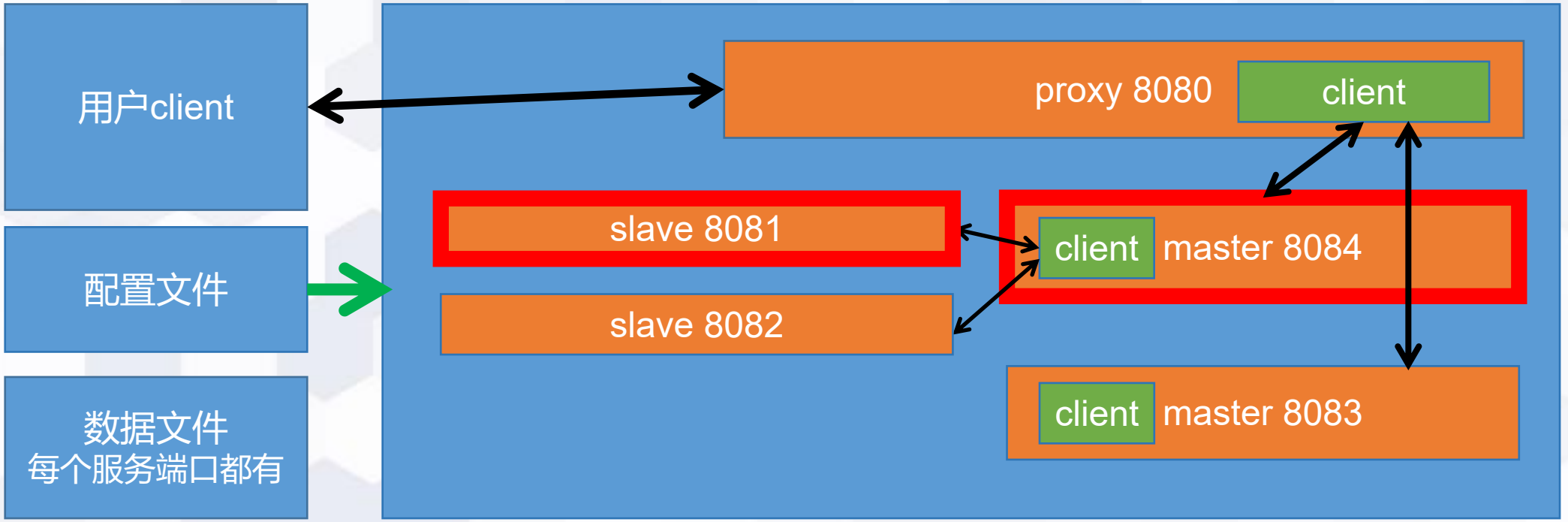
信息逐级返回最后由用户client处理



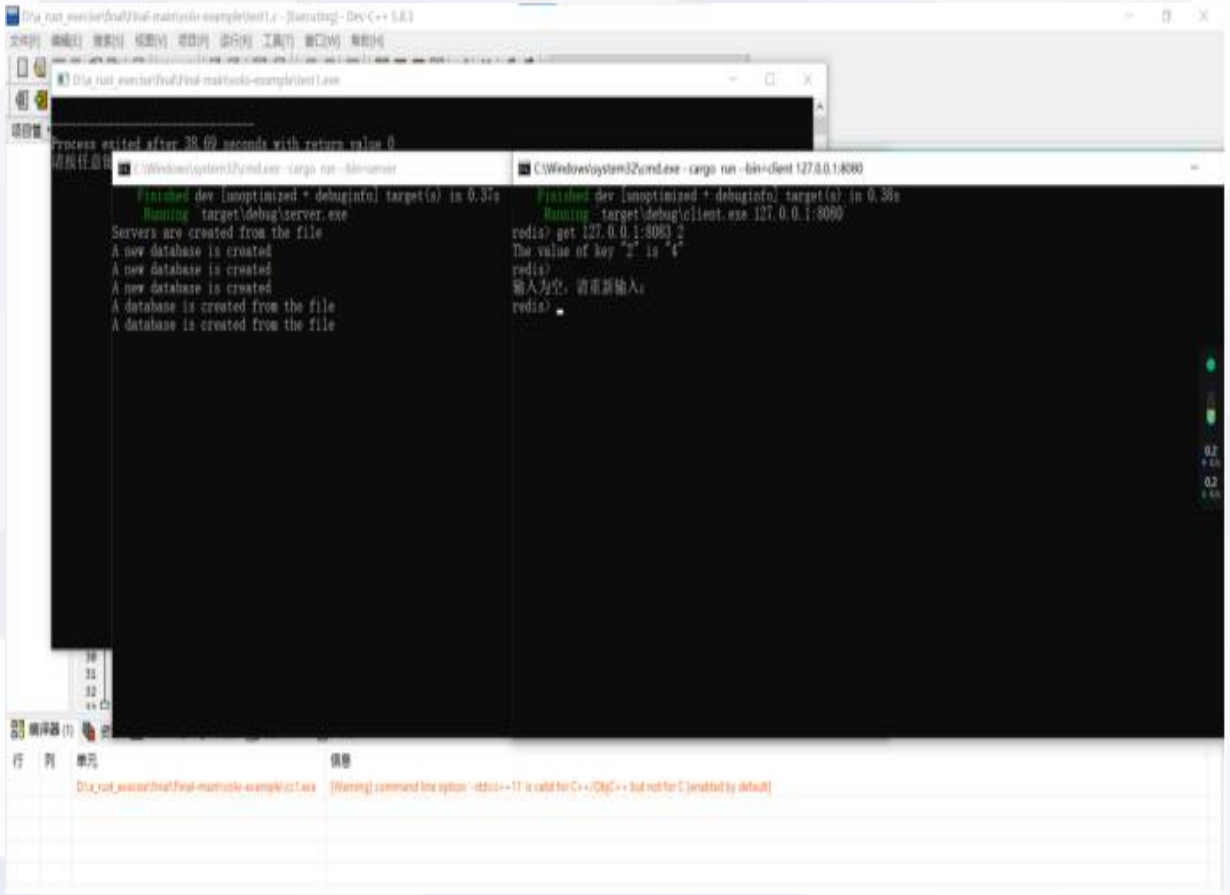
主从&cluster

以set 127.0.0.1:8084 2 4为例

redis master server



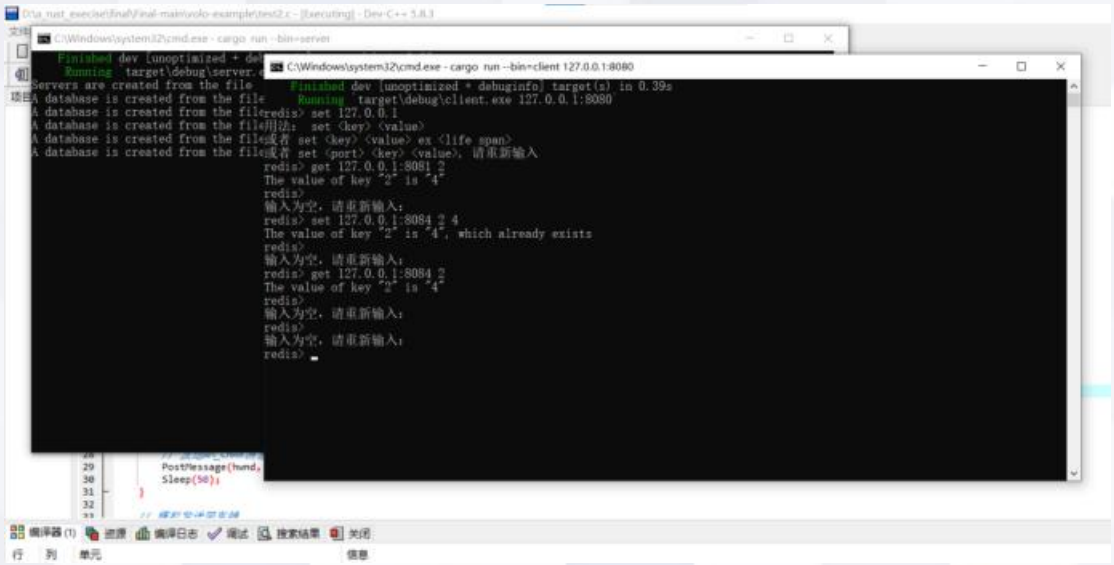
测试结果展示



1.AOF （Append-only File）实现持久化

打开client和server，client发送set操作，然后重启，再用 client 进行 Get 调用，可以访问到之前的数据。

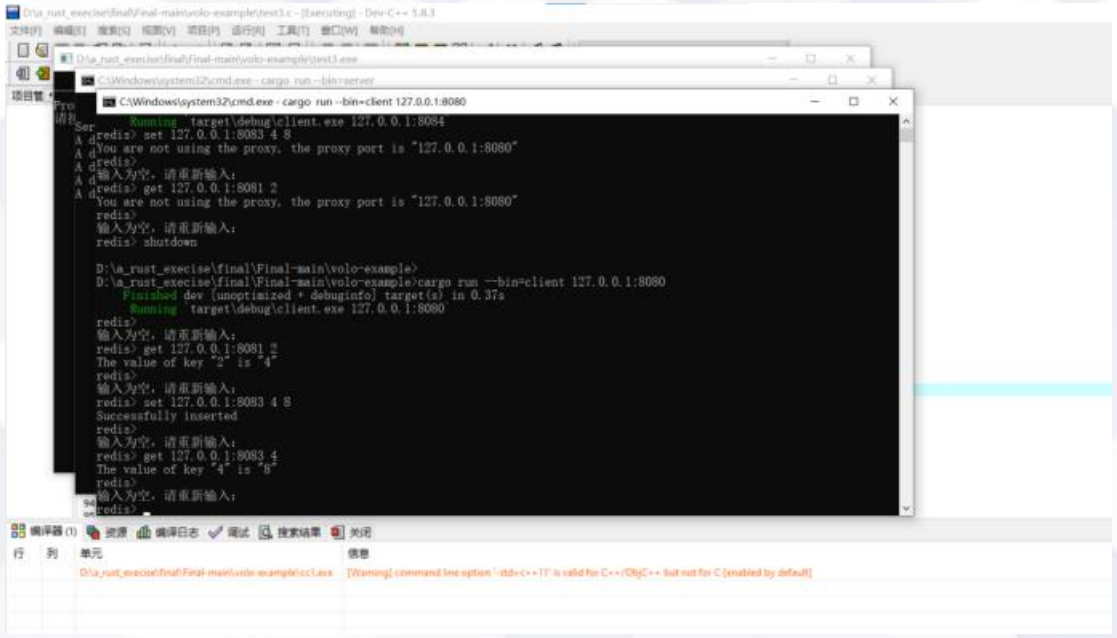
测试结果展示



2.Redis 主从架构

从节点对于 Set 操作返回错误 。

对主节点进行 Set 操作，可以通过从节点通过 Get 获取到设置的数据。



3.Redis cluster

根据 Get 和 Set 目标的 key 将请求分发到不同的 redis 实例进行处理。

谢谢观看

T H A N K S