网络配置实验

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任务1

错误：Router3不应该配20开头的公网ip地址，改成`10.2.3.3`

第一处：Router2的端口2与Router3相连，应与Router3的端口1的ip地址处于同一子网，配成`10.2.3.1`

第二处：Server0的网关，由于Server0处在Router1的端口1所在的子网内，因此其网关应设置为Router1端口1的ip，即`192.168.1.1`。

以下是ip分配方案完整表格，修改的部分用粗体表示：

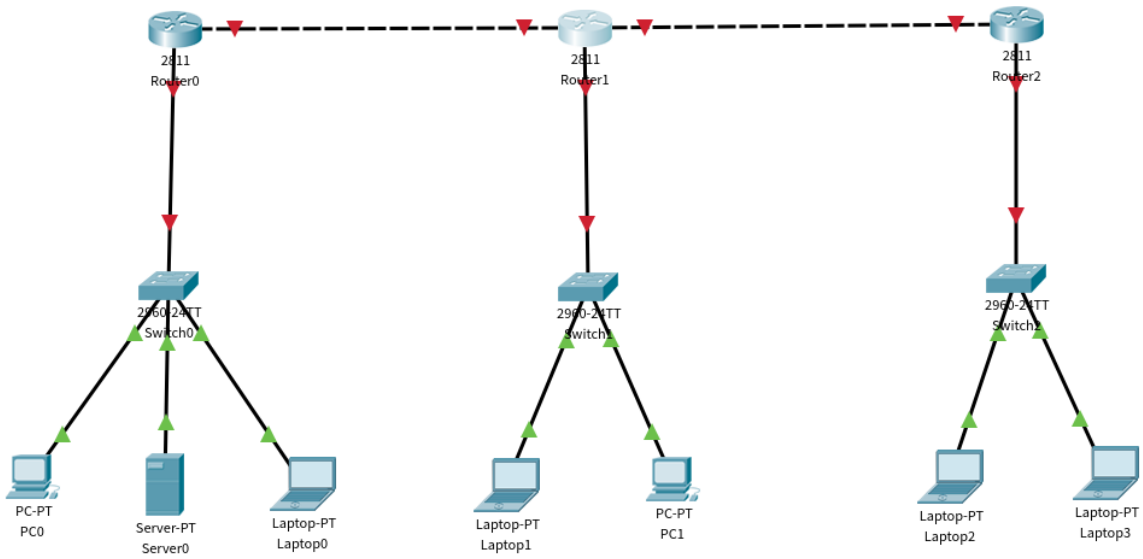
Device	Port	IP	Mask	Gateway
Router1	端口1	192.168.1.1	/24	-
	端口2	10.1.2.1	/24	-
Router2	端口1	10.1.2.2	/24	-
	端口2	**10.2.3.1**	/24	-
	端口3	192.168.2.1	/24	-
Router3	端口1	**10**.2.3.3	/24	-
	端口2	192.168.3.1	/24	-
PC0	端口1	192.168.1.2	/24	192.168.1.1
PC1	端口1	192.168.2.2	/24	192.168.2.1
Server0	端口1	192.168.1.3	/24	**192.168.1.1**
Laptop0	端口1	192.168.1.4	/24	192.168.1.1
Laptop1	端口1	192.168.2.3	/24	192.168.2.1
Laptop2	端口1	192.168.3.2	/24	192.168.3.1
Laptop3	端口1	192.168.3.3	/24	192.168.3.1

由于Router从1开始编号非常不好，下面就都是Router[0,1,2]（其实是做到任务3反应过来之后图都截完了不想在截一遍……）

任务2

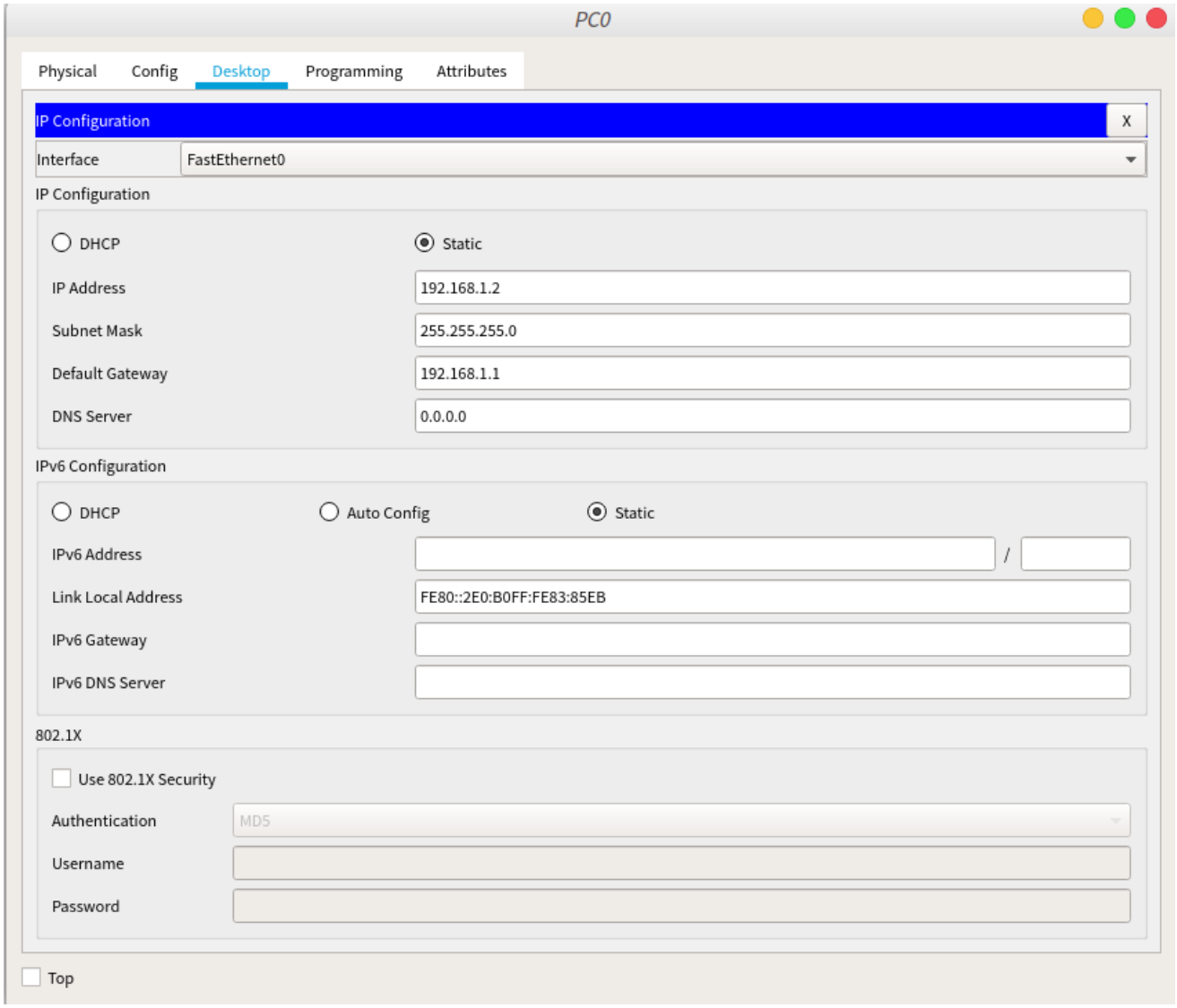
PacketTracer版本为7.2，运行在Ubuntu18.04中。6.3的windows版本直接用wine在ubuntu下运行有一些问题。

首先选用交换机型号为`2960-24TT`，路由器型号为`2811`。给Router1增加一块`NM-1FE-TX`扩展模 块之后，初步连线如下：



可以看到下面的网络设备连接成功，但是路由器之间并不能相互通信。接下来要按照任务1中的ip分配方案配置各台机器的ip，对于终端设备而言（此处以PC0为例）：

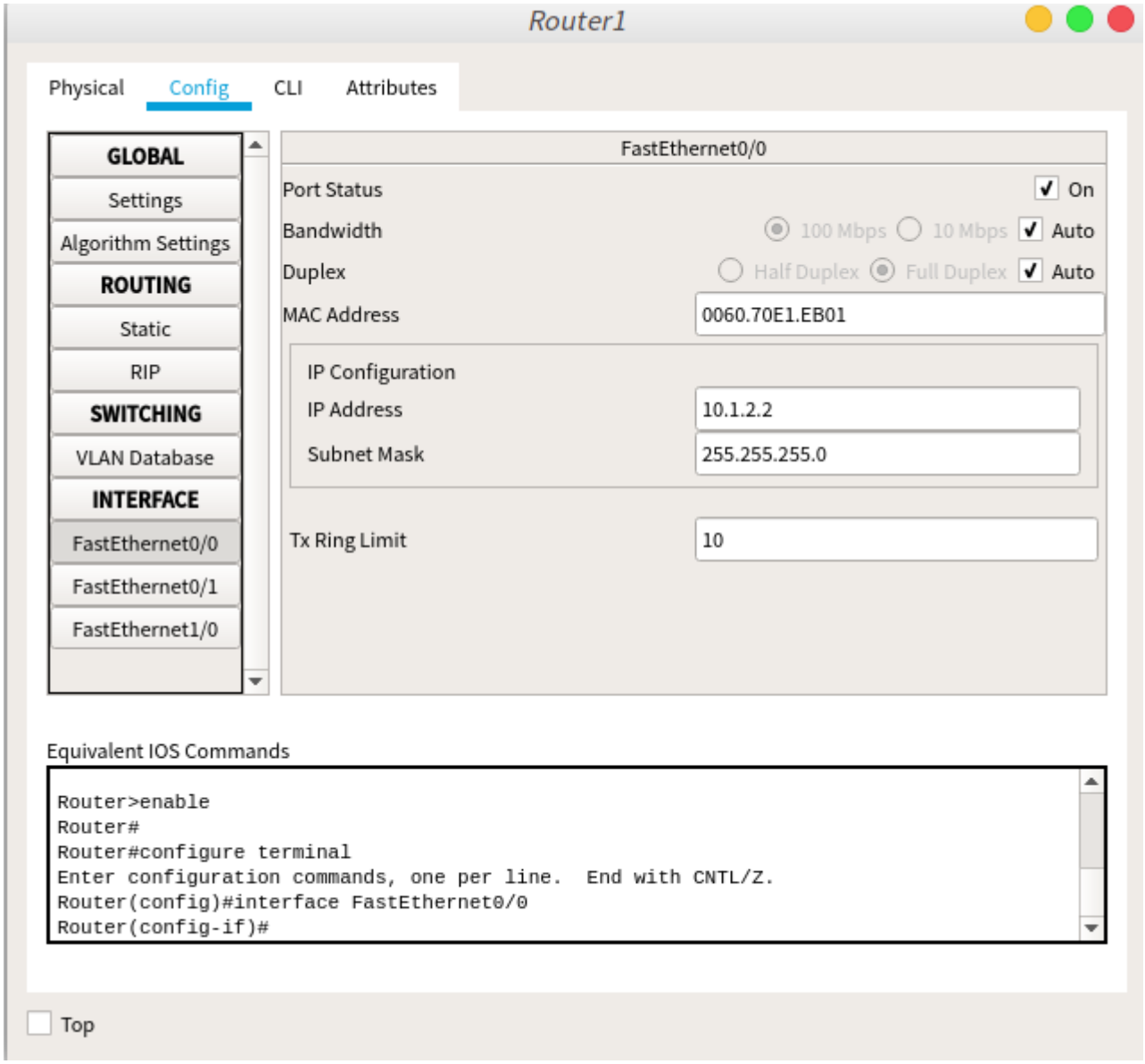
1. 点击`PC0 -> Desktop -> IP Configuration`
2. 选择静态路由`static`选项，依次填充`IP Address`、`Subnet Mask`、`Default Gateway`选项，如下图所示：



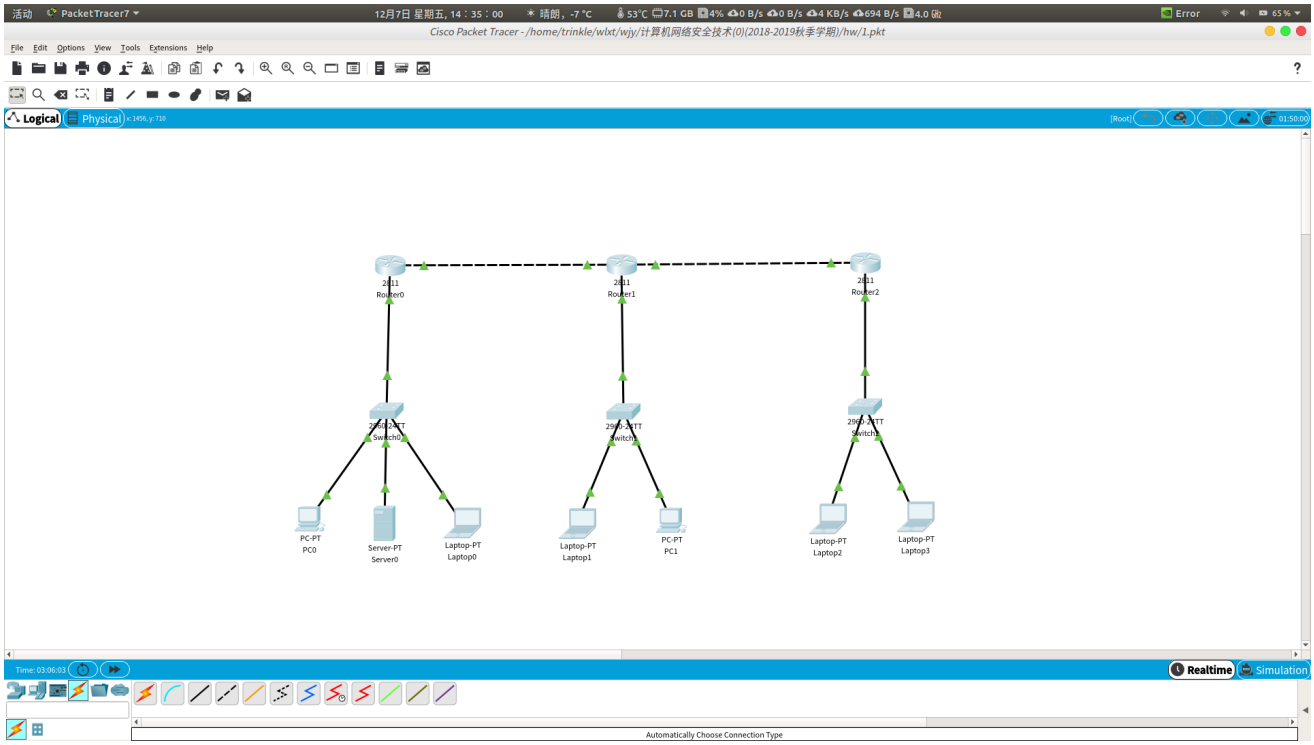
对于路由器而言（此处以Router1为例）：

1. 点击 `Router1 -> Config -> FastEthernet0/0`
2. 勾选 `On`
3. 在 `IP Configuration` 填充 `IP Address`、`Subnet Mask` 字段
4. 点击下一个 `FastEthernet`，重复过程1~3，直至所有端口配置完成

路由器的一个端口配置完成之后的界面如下所示：



都配置完成之后，可以看到线全变绿了，说明配置成功。截屏如下：



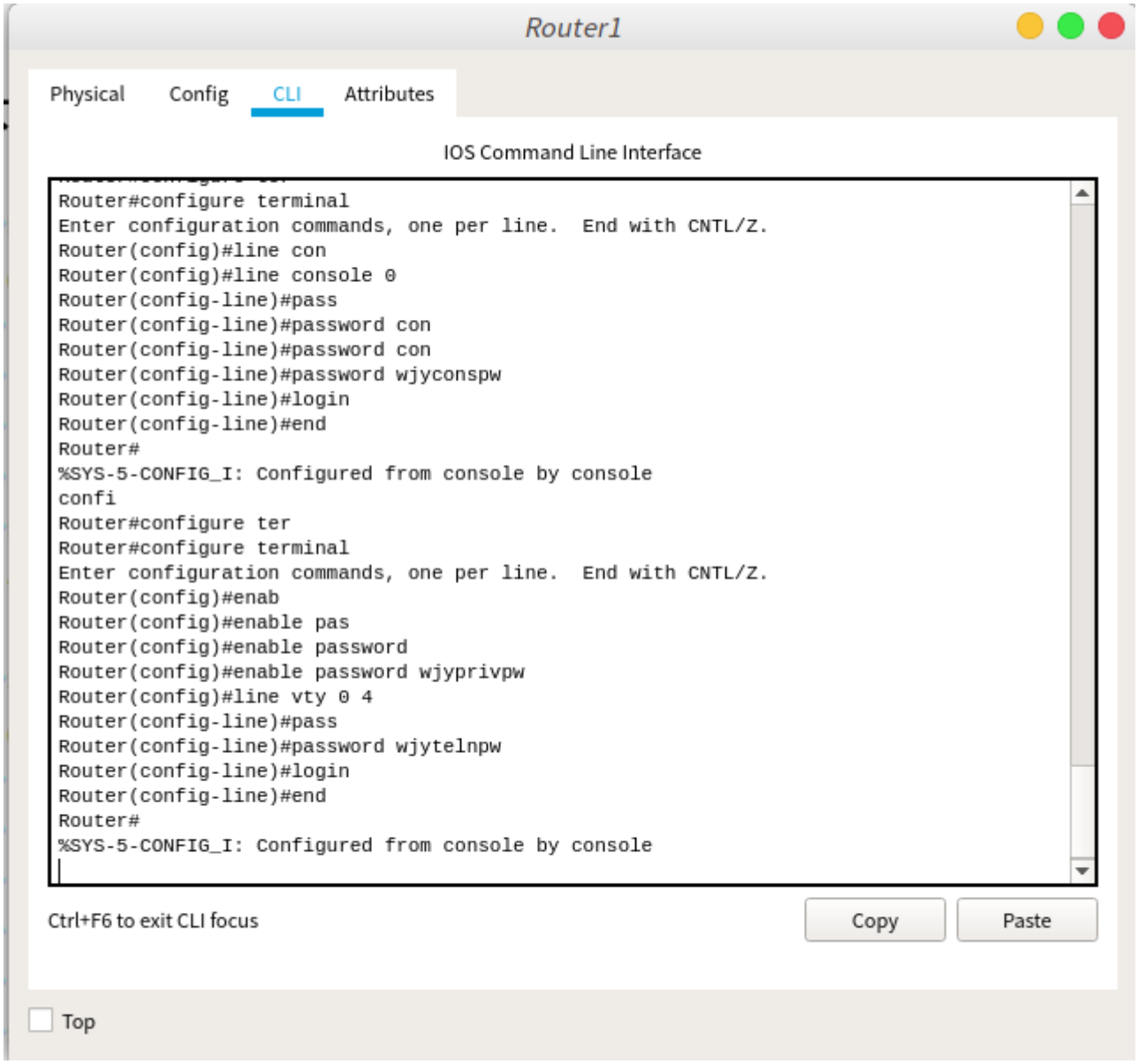
任务3

（其实在哪个Router设置密码都一样）

打开Router1的CLI，enable之后进入特权模式，输入如下命令：

```
configure terminal
line console 0
password wjyconspw # set console password
login
end

configure terminal
enable password wjyprivpw # set privilege password
line vty 0 4
password wjytelnpw # set telnet password
login
end
```

截图如下：（特地以自己名字首字母wjy打头进行身份验证）



查看password2配置：`show running-config`

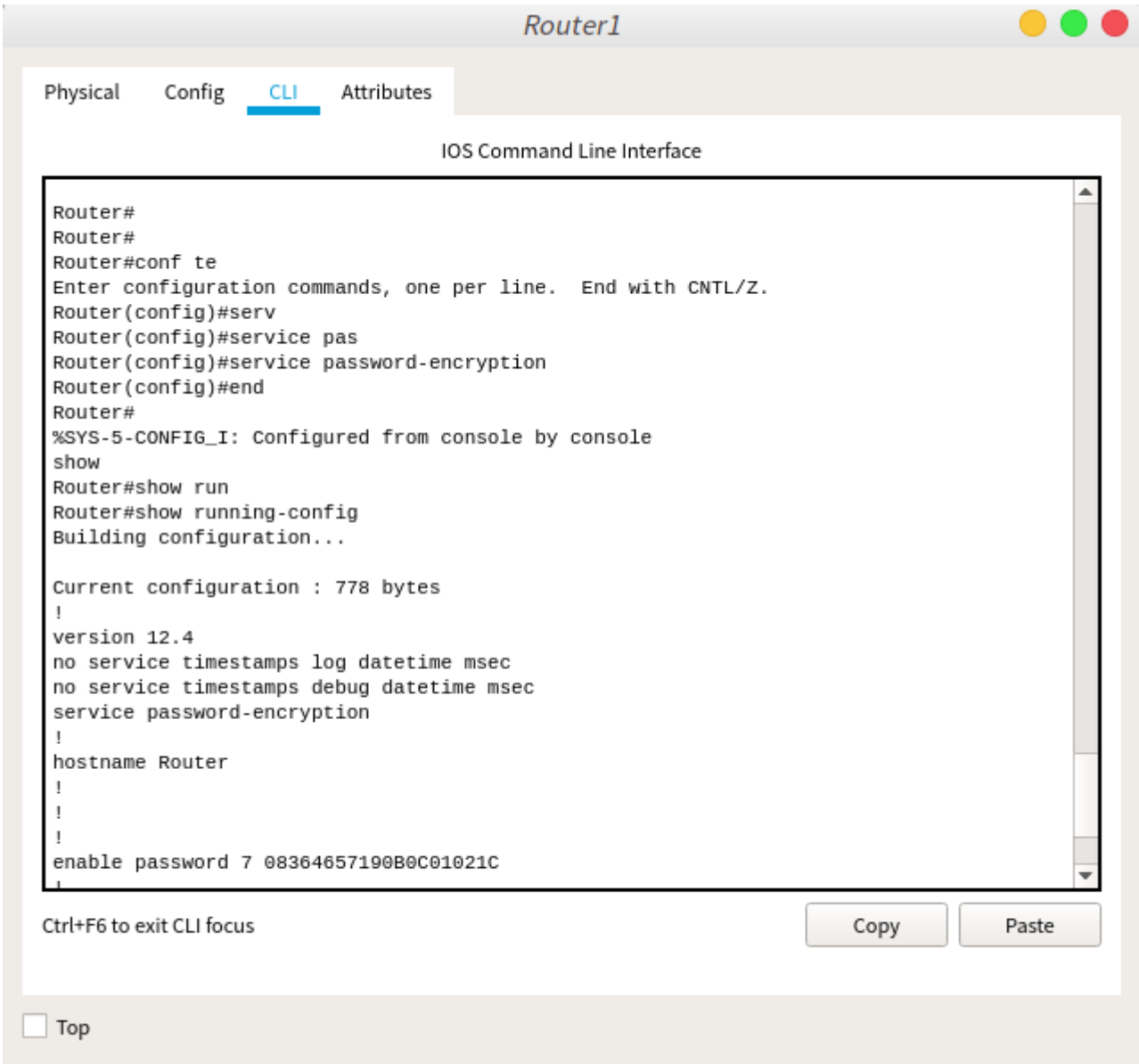
```
Router#show running-config
Building configuration...

Current configuration : 742 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
enable password wjyprivpw
!
```

查看password1和3的配置：

```
!
line con 0
 password wjyconspw
 login
!
line aux 0
!
line vty 0 4
 password wjytelnpw
 login
!
```

可见密码均以明文形式存储

当路由器配置文件可能被泄露时，使用密文存储密码，即使用命令 `service password-encryption`




```
line con 0
 password 7 083646570A160B04021C
 login
!
line aux 0
!
line vty 0 4
 password 7 083646571D1C0919021C
 login
!
```

可以看到所有密码都以加密形式存储在路由器配置文件中，因此当路由器配置文件遭到泄露时依然有安全保障。

以下是测试密码是否真的生效了：

```
User Access Verification

Password:

Router>enable
Password:
Router#
```

任务4

设置路由器的静态路由表：以Router0的配置为例，将所有无法由Router0直达的网段全部配置路由，如下所示：

```
configure terminal
ip route 192.168.2.0 255.255.255.0 10.1.2.2
ip route 192.168.3.0 255.255.255.0 10.1.2.2
ip route 10.2.3.0 255.255.255.0 10.1.2.2
```

```
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 192.168.2.0 255.255.255.0 10.1.2.2
Router(config)#ip route 192.168.3.0 255.255.255.0 10.1.2.2
Router(config)#ip route 10.2.3.0 255.255.255.0 10.1.2.2
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 2 subnets
C       10.1.2.0 is directly connected, FastEthernet0/1
S       10.2.3.0 [1/0] via 10.1.2.2
C    192.168.1.0/24 is directly connected, FastEthernet0/0
S    192.168.2.0/24 [1/0] via 10.1.2.2
S    192.168.3.0/24 [1/0] via 10.1.2.2

Router#
```

Router1：

```
configure terminal
ip route 192.168.1.0 255.255.255.0 10.1.2.1
ip route 192.168.3.0 255.255.255.0 10.2.3.3
```

```
Router>enable
Password:
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 192.168.1.0 255.255.255.0 10.1.2.1
Router(config)#ip route 192.168.3.0 255.255.255.0 10.2.3.3
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 2 subnets
C       10.1.2.0 is directly connected, FastEthernet0/0
C       10.2.3.0 is directly connected, FastEthernet0/1
S    192.168.1.0/24 [1/0] via 10.1.2.1
C    192.168.2.0/24 is directly connected, FastEthernet1/0
S    192.168.3.0/24 [1/0] via 10.2.3.3

Router#
```

Router2:

```
configure terminal
ip route 192.168.1.0 255.255.255.0 10.2.3.1
ip route 192.168.2.0 255.255.255.0 10.2.3.1
ip route 10.1.2.0 255.255.255.0 10.2.3.1
```

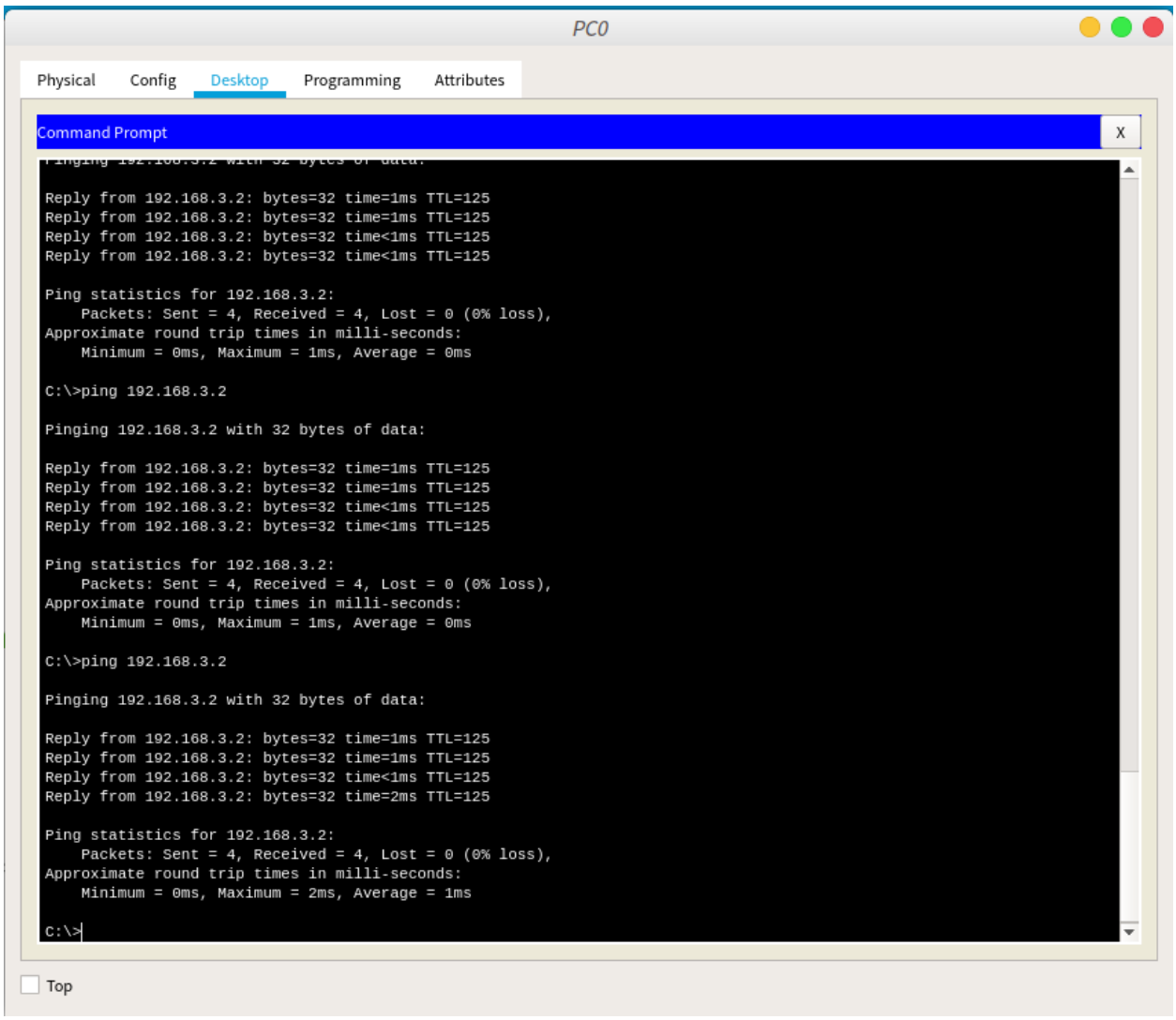
```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 192.168.1.0 255.255.255.0 10.2.3.1
Router(config)#ip route 192.168.2.0 255.255.255.0 10.2.3.1
Router(config)#ip route 10.1.2.0 255.255.255.0 10.2.3.1
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 2 subnets
S       10.1.2.0 [1/0] via 10.2.3.1
C       10.2.3.0 is directly connected, FastEthernet0/0
S    192.168.1.0/24 [1/0] via 10.2.3.1
S    192.168.2.0/24 [1/0] via 10.2.3.1
C    192.168.3.0/24 is directly connected, FastEthernet0/1

Router#
```

icmp ping测试：

1. Router2 ping Router0

```
Router#ping 10.1.2.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.2.1, timeout is 2 seconds:
..!!!
Success rate is 60 percent (3/5), round-trip min/avg/max = 0/0/1 ms

Router#ping 10.1.2.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.2.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Router#
```

2. PC0 ping Laptop2



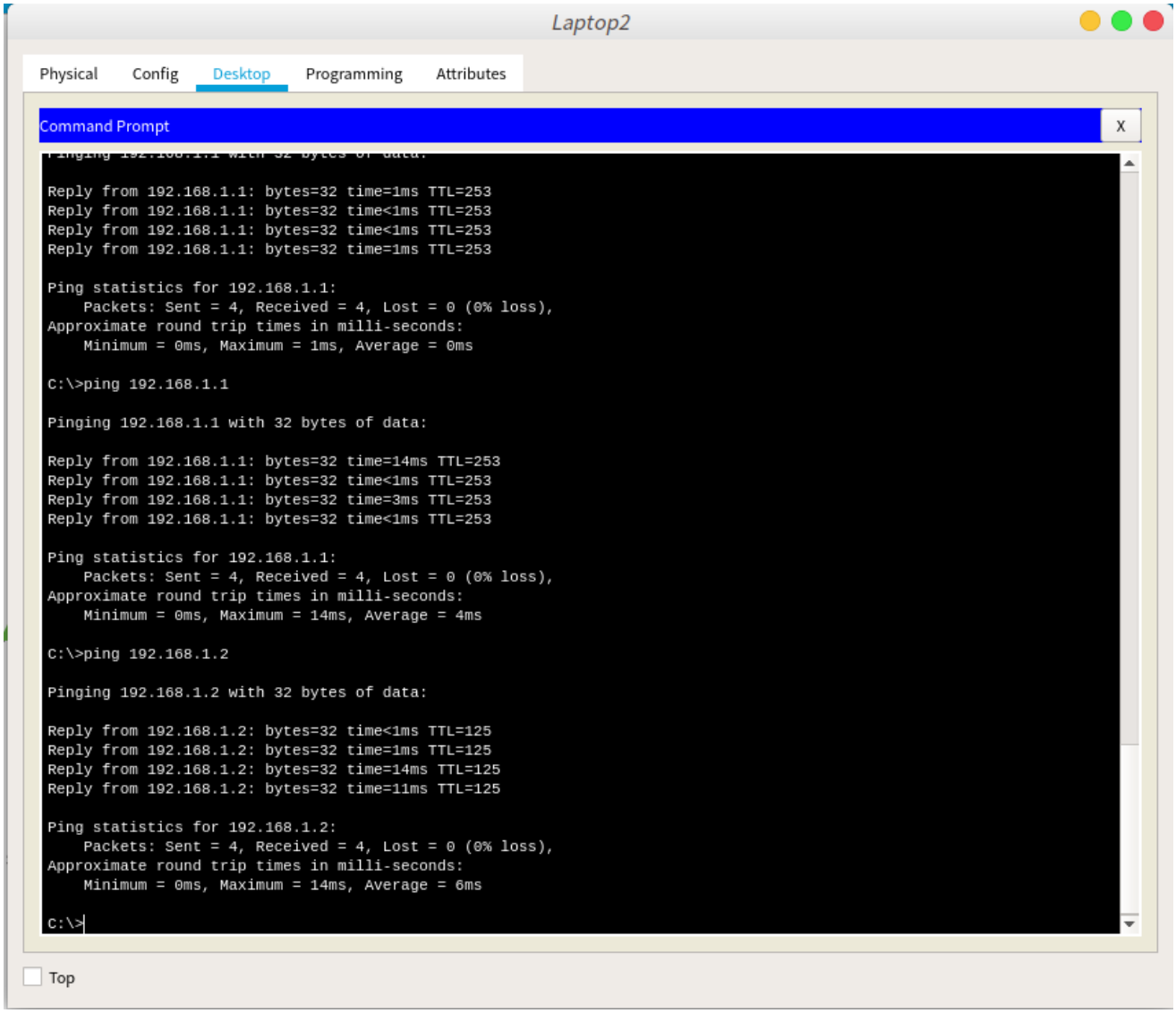
任务5

存在问题，RIP协议上限为16跳，也就是如果一个网络的直径不超过15即可适用RIP协议。考虑极端情况，16台设备连成一条链，直径为16，一端无法传递信息到另一端。

一般而言，维护公司局域网使用RIP协议即可。对每个路由器使用RIPv2协议配置动态路由，以Router2为例：

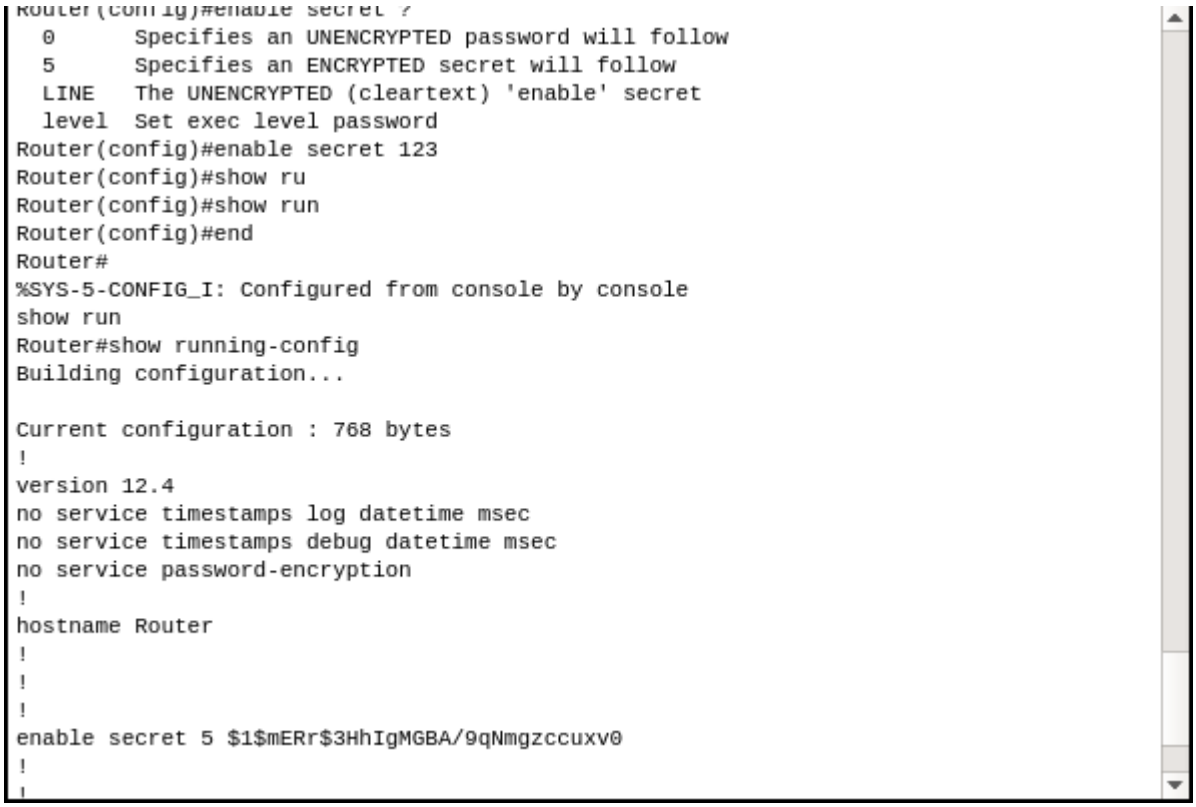
```
Router#
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
Router(config)#no ip route 192.168.1.0 255.255.255.0 10.2.3.1
Router(config)#no ip route 192.168.2.0 255.255.255.0 10.2.3.1
Router(config)#no ip route 10.1.2.0 255.255.255.0 10.2.3.1
Router(config)#
Router(config)#router rip
Router(config-router)#network 192.168.3.0
Router(config-router)#network 10.0.0.0
Router(config-router)#
```

配置生效之后点击加速，然后测试Laptop2 ping PC0：



Bonus

设置密码为123之后：



更多尝试:

```
123          -> secret 5 $1$mERr$3HhIgMGBA/9qNmgzccuxv0
124          -> secret 5 $1$mERr$05KPbY0jaeCDqx5NXF.9J/
125          -> secret 5 $1$mERr$otG8qqYg/7DRk46LIxkf7.
125555555555 -> secret 5 $1$mERr$IkHkNYNMw8gKLFtbI6NPs/

# 另一个Router
123          -> secret 5 $1$mERr$3HhIgMGBA/9qNmgzccuxv0
```

`$1$mERr$`应该是固定前缀，和Router无关。搜`cisco secret5`发现是MD5，1指MD5，mERr是salt，在linux下使用`openssl`验证:

```
➜  ~ openssl passwd -1 -salt mERr -table 123
123 $1$mERr$3HhIgMGBA/9qNmgzccuxv0
```