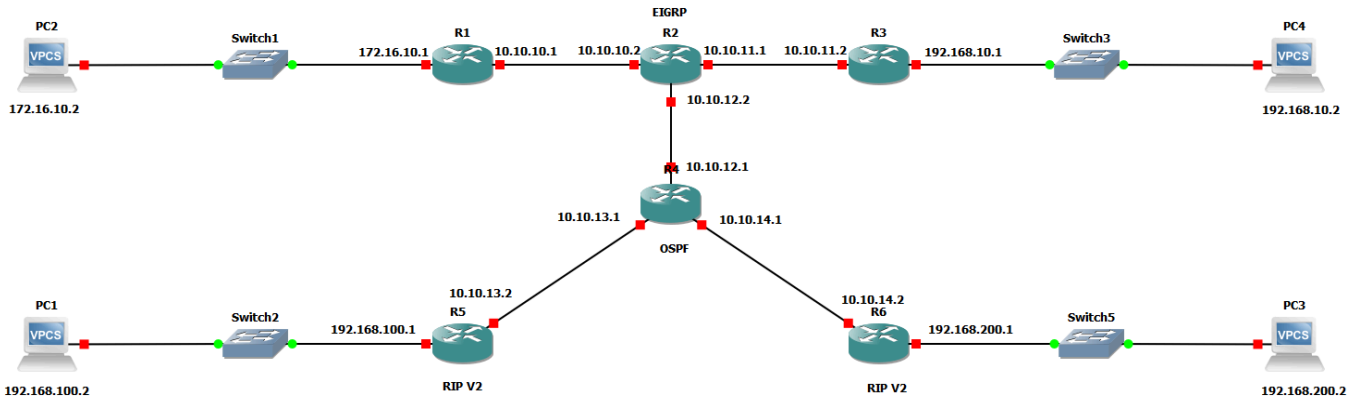
# 🛰️ GNS3 Project – EIGRP, OSPF, and RIP Redistribution with Wireshark Packet Capture

## 📘 Project Overview

This project demonstrates the configuration of **EIGRP**, **OSPF**, and **RIP** routing protocols in a mixed routing environment.
The goal is to establish full network connectivity between routers using **route redistribution** on Router R4 and verify communication using **Wireshark captures** for:

- EIGRP Hello packets
- OSPF Hello packets
- ICMP (Ping) packets

## 🧩 Network Topology



## 🌐 IP Addressing Summary

| Router | Interface | IP Address | Subnet Mask | Connected To |
|---|---|---|---|---|
| R1 | G0/0 | 172.16.10.1 | 255.255.255.0 | LAN |
| R1 | G1/0 | 10.10.10.1 | 255.255.255.252 | R2 |
| R2 | G0/0 | 10.10.10.2 | 255.255.255.252 | R1 |
| R2 | G1/0 | 10.10.11.1 | 255.255.255.252 | R3 |
| R2 | G3/0 | 10.10.12.2 | 255.255.255.252 | R4 |
| R3 | G1/0 | 10.10.11.2 | 255.255.255.252 | R2 |
| R3 | G0/0 | 192.168.10.1 | 255.255.255.0 | LAN |
| R4 | G0/0 | 10.10.12.1 | 255.255.255.252 | R2 |
| R4 | G1/0 | 10.10.13.1 | 255.255.255.252 | R5 |
| R4 | G2/0 | 10.10.14.1 | 255.255.255.252 | R6 |
| R4 | Lo0 | 1.1.1.1 | 255.255.255.255 | Loopback |
| R5 | G0/0 | 10.10.13.2 | 255.255.255.252 | R4 |
| R5 | G1/0 | 192.168.100.1 | 255.255.255.0 | LAN |
| R6 | G0/0 | 10.10.14.2 | 255.255.255.252 | R4 |
| R6 | G1/0 | 192.168.200.1 | 255.255.255.0 | LAN |

## ⚙️ Routing Protocol Configuration Summary

🟢 R1, R2, R3 — EIGRP (AS 100)

Used for communication between R1, R2, and R3.

🔵 R4 — OSPF Area 0 + Redistribution

Acts as the **redistribution router** between EIGRP, OSPF, and RIP domains.

🟣 R5, R6 — RIP v2

Used for legacy network connectivity and redistributed into OSPF.

## 🔁 Redistribution Summary

R4 performs **mutual redistribution**:

- EIGRP ↔ OSPF
- OSPF ↔ RIP
- EIGRP ↔ RIP

This ensures all routers (R1–R6) can reach every network.

## 🧪 Wireshark Verification

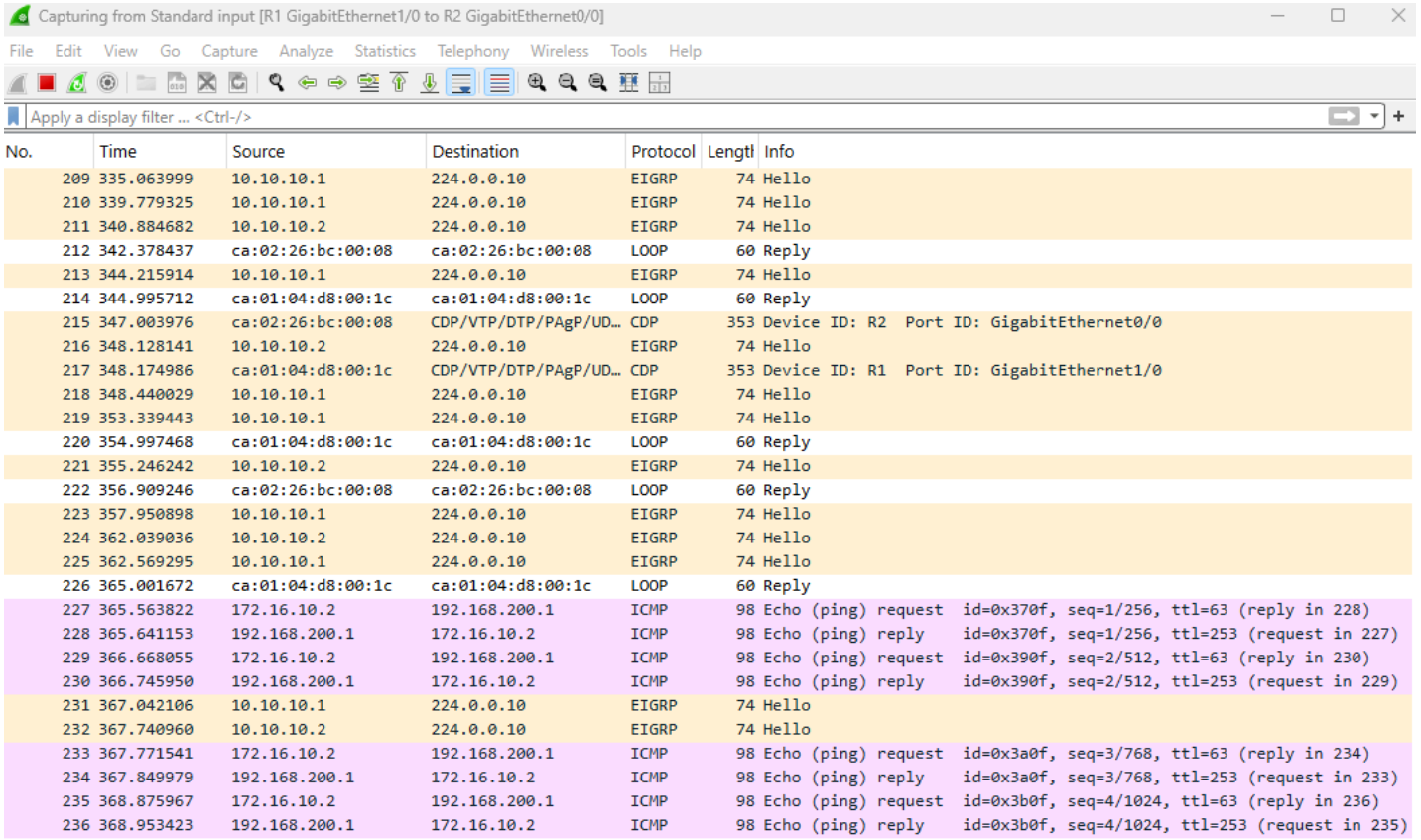
| Capture Type | Interface | Protocol | Expected Packet |
|---|---|---|---|
| EIGRP Hello | Between R1–R2 | EIGRP | Multicast to 224.0.0.10 |
| OSPF Hello | Between R2–R4 | OSPF | Multicast to 224.0.0.5 |
| ICMP | Between R1–R6 | ICMP | Echo Request / Echo Reply |

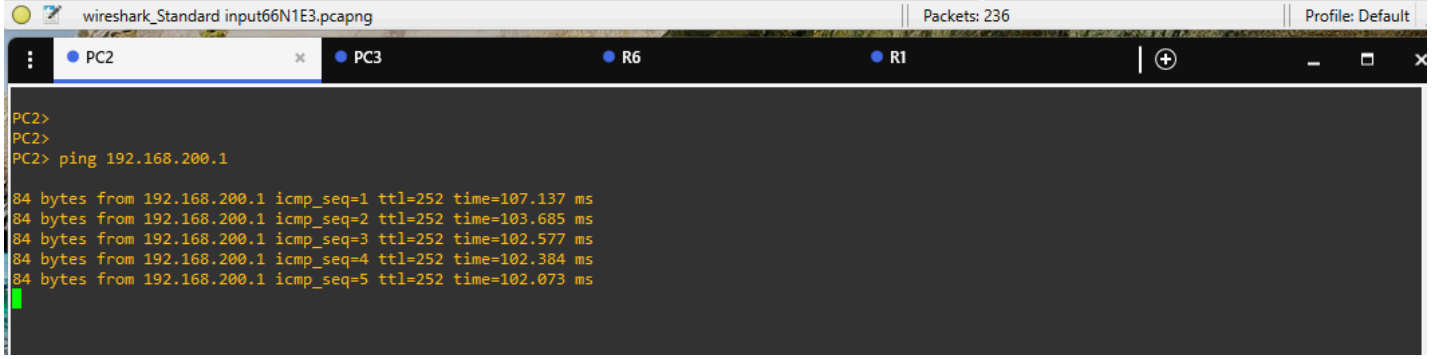
**Steps:**

1. Start **Wireshark** on the desired link interface.
2. Use filters:
    - `eigrp`
    - `ospf`
    - `icmp`
3. Ping across networks (e.g., R1 → R6) to generate ICMP traffic.
4. Capture and analyze Hello and ICMP packets.

## 📂 Project Files

- `GNS3_Project_Files/` — contains the GNS3 topology and configs.
- `configurations/` — contains router configuration text files (`R1.txt` – `R6.txt`).
- `screenshots/` — topology and Wireshark output screenshots.


Capturing from Standard input [R1 GigabitEthernet1/0 to R2 GigabitEthernet0/0]
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
No. Time Source Destination Protocol Lengtl Info
209 335.063999 10.10.10.1 224.0.0.10 EIGRP 74 Hello
210 339.779325 10.10.10.1 224.0.0.10 EIGRP 74 Hello
211 340.884682 10.10.10.2 224.0.0.10 EIGRP 74 Hello
212 342.378437 ca:02:26:bc:00:08 ca:02:26:bc:00:08 LOOP 60 Reply
213 344.215914 10.10.10.1 224.0.0.10 EIGRP 74 Hello
214 344.995712 ca:01:04:d8:00:1c ca:01:04:d8:00:1c LOOP 60 Reply
215 347.003976 ca:02:26:bc:00:08 CDP/VTP/DTP/PAgP/UD… CDP 353 Device ID: R2 Port ID: GigabitEthernet0/0
216 348.128141 10.10.10.2 224.0.0.10 EIGRP 74 Hello
217 348.174986 ca:01:04:d8:00:1c CDP/VTP/DTP/PAgP/UD… CDP 353 Device ID: R1 Port ID: GigabitEthernet1/0
218 348.440029 10.10.10.1 224.0.0.10 EIGRP 74 Hello
219 353.339443 10.10.10.1 224.0.0.10 EIGRP 74 Hello
220 354.997468 ca:01:04:d8:00:1c ca:01:04:d8:00:1c LOOP 60 Reply
221 355.246242 10.10.10.2 224.0.0.10 EIGRP 74 Hello
222 356.909246 ca:02:26:bc:00:08 ca:02:26:bc:00:08 LOOP 60 Reply
223 357.950898 10.10.10.1 224.0.0.10 EIGRP 74 Hello
224 362.039036 10.10.10.2 224.0.0.10 EIGRP 74 Hello
225 362.569295 10.10.10.1 224.0.0.10 EIGRP 74 Hello
226 365.001672 ca:01:04:d8:00:1c ca:01:04:d8:00:1c LOOP 60 Reply
227 365.563822 172.16.10.2 192.168.200.1 ICMP 98 Echo (ping) request id=0x370f, seq=1/256, ttl=63 (reply in 228)
228 365.641153 192.168.200.1 172.16.10.2 ICMP 98 Echo (ping) reply id=0x370f, seq=1/256, ttl=253 (request in 227)
229 366.668055 172.16.10.2 192.168.200.1 ICMP 98 Echo (ping) request id=0x390f, seq=2/512, ttl=63 (reply in 230)
230 366.745950 192.168.200.1 172.16.10.2 ICMP 98 Echo (ping) reply id=0x390f, seq=2/512, ttl=253 (request in 229)
231 367.042106 10.10.10.1 224.0.0.10 EIGRP 74 Hello
232 367.740960 10.10.10.2 224.0.0.10 EIGRP 74 Hello
233 367.771541 172.16.10.2 192.168.200.1 ICMP 98 Echo (ping) request id=0x3a0f, seq=3/768, ttl=63 (reply in 234)
234 367.849979 192.168.200.1 172.16.10.2 ICMP 98 Echo (ping) reply id=0x3a0f, seq=3/768, ttl=253 (request in 233)
235 368.875967 172.16.10.2 192.168.200.1 ICMP 98 Echo (ping) request id=0x3b0f, seq=4/1024, ttl=63 (reply in 236)
236 368.953423 192.168.200.1 172.16.10.2 ICMP 98 Echo (ping) reply id=0x3b0f, seq=4/1024, ttl=253 (request in 235)
Frame 81: Packet, 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface -, id 0
Ethernet II, Src: ca:02:26:bc:00:08 (ca:02:26:bc:00:08), Dst: IPv4mcast_0a (01:00:5e:00:00:0a)
Internet Protocol Version 4, Src: 10.10.10.2, Dst: 224.0.0.10
Cisco EIGRP
0000 01 00 5e 00 00 0a ca 02 26 bc 00 08 08
0010 00 3c 00 00 00 00 02 58 c3 94 0a 0a 0a
0020 00 0a 02 05 ee 68 00 00 00 00 00 00 00
0030 00 00 00 00 00 64 00 01 00 0c 01 00 01
0040 00 0f 00 04 00 08 0c 04 01 02
wireshark_Standard input66N1E3.pcapng
Packets: 236
Profile: Default


PC2
PC3
R6
R1
PC2>
PC2>
PC2> ping 192.168.200.1
84 bytes from 192.168.200.1 icmp_seq=1 ttl=252 time=107.137 ms
84 bytes from 192.168.200.1 icmp_seq=2 ttl=252 time=103.685 ms
84 bytes from 192.168.200.1 icmp_seq=3 ttl=252 time=102.577 ms
84 bytes from 192.168.200.1 icmp_seq=4 ttl=252 time=102.384 ms
84 bytes from 192.168.200.1 icmp_seq=5 ttl=252 time=102.073 ms

## 📸 Example Verification

- **EIGRP Hello:** Sent to `224.0.0.10` every 5 seconds
- **OSPF Hello:** Sent to `224.0.0.5` every 10 seconds
- **ICMP Echo:** Successful reply from 192.168.200.1 to 172.16.10.2

## ✅ Results

- All routers successfully exchanged routes through redistribution.
- Full network reachability verified using ICMP.
- Hello packets captured and analyzed successfully in Wireshark.

👨‍💻 Author

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GNS3 Network Simulation Project – *EIGRP, OSPF, RIP with Wireshark Analysis*