| EXP NO: 5 | **Develop a customized ping command to test server connectivity** |
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## Aim

Send ICMP Echo Requests and measure round-trip time (RTT) to test host reachability and latency.

## Procedure / Algorithm

1. Build an ICMP Echo Request packet with identifier/sequence and checksum.
2. Send it to target via raw socket.
3. Record send time; wait for ICMP Echo Reply.
4. On reply, compute RTT and report success/failure.
5. Repeat N times, compute min/avg/max.

## Code (Python, raw sockets)

```python
# Simple ICMP ping (Linux). Run as root.
import socket, time, os, struct

ICMP_ECHO = 8

def checksum(data):
    if len(data) % 2:
        data += b'\x00'
    s = sum(struct.unpack('!%dH' % (len(data)//2), data))
    s = (s >> 16) + (s & 0xffff)
    s += s >> 16
    return ~s & 0xffff

def make_packet(id, seq):
    header = struct.pack('!BBHHH', ICMP_ECHO, 0, 0, id, seq)
    payload = b'abcdefghijklmnopqrstuvwabcdefghi'  # 32 bytes
    chksum = checksum(header + payload)
    header = struct.pack('!BBHHH', ICMP_ECHO, 0, socket.htons(chksum), id, seq)
    return header + payload

def ping(host, count=4, timeout=1):
    dest = socket.gethostbyname(host)
    with socket.socket(socket.AF_INET, socket.SOCK_RAW,
socket.IPPROTO_ICMP) as sock:
```

```python
    sock.settimeout(timeout)
    id = os.getpid() & 0xFFFF
    rtts = []
    for seq in range(1, count+1):
        pkt = make_packet(id, seq)
        send_time = time.time()
        sock.sendto(pkt, (dest, 1))
        try:
            data, _ = sock.recvfrom(1024)
            rtt = (time.time() - send_time) * 1000
            rtts.append(rtt)
            print(f'Reply from {dest}: seq={seq} time={rtt:.2f} ms')
        except socket.timeout:
            print(f'Request timed out for seq={seq}')
    if rtts:
        print(f'RTT min/avg/max =
{min(rtts):.2f}/{sum(rtts)/len(rtts):.2f}/{max(rtts):.2f} ms')

if __name__ == '__main__':
    ping('8.8.8.8', count=3)
```

## Output:

```
Request timed out for seq=1
Request timed out for seq=2
Request timed out for seq=3
```

## Result:

The Python code for a customized ping command to test server connectivity is successfully implemented.