

關於 Linux 網路，你必須知道這些

網路模型

OSI 模型

TCP/IP 模型



網路封包由上層帶到下層

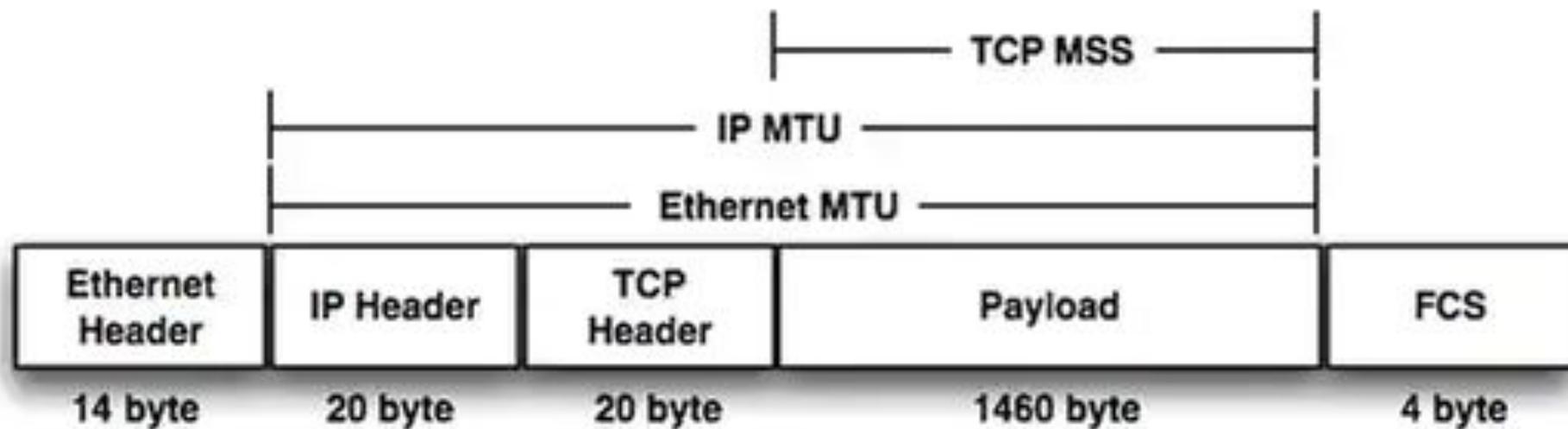


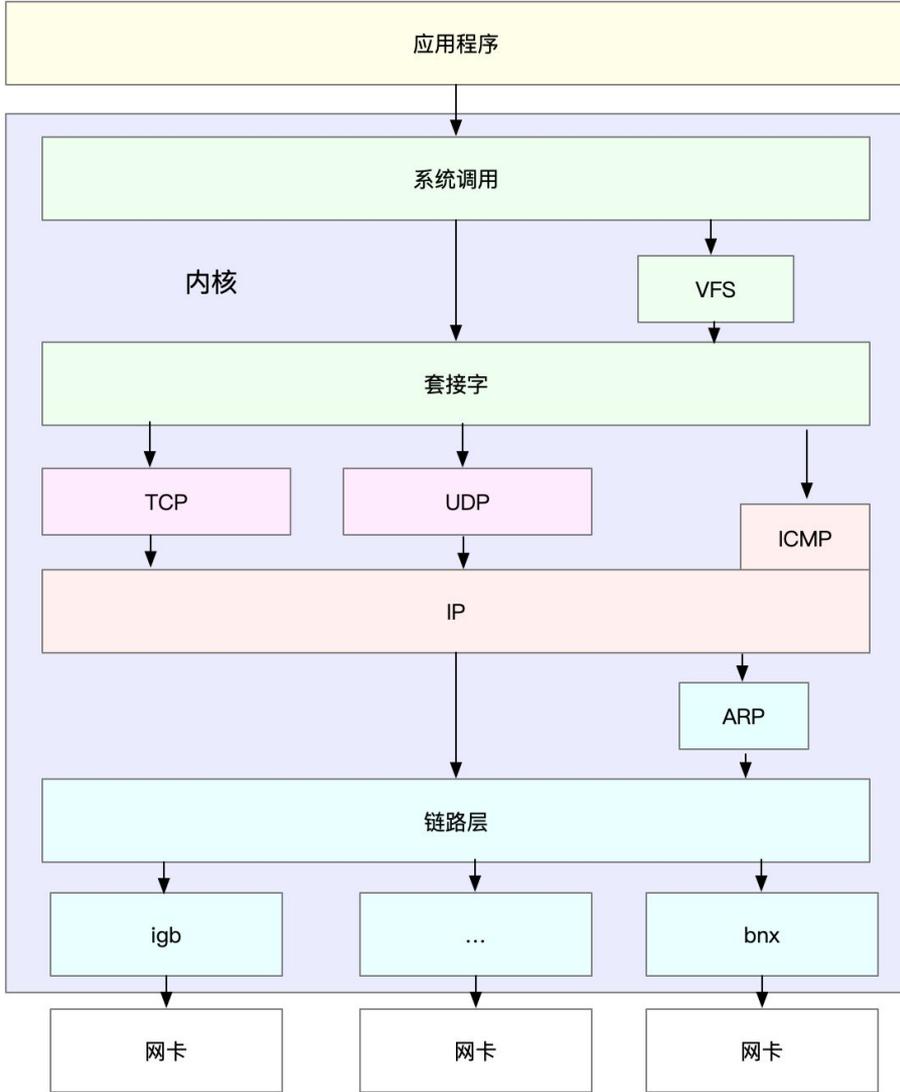
網路封包的組成

TCP表頭

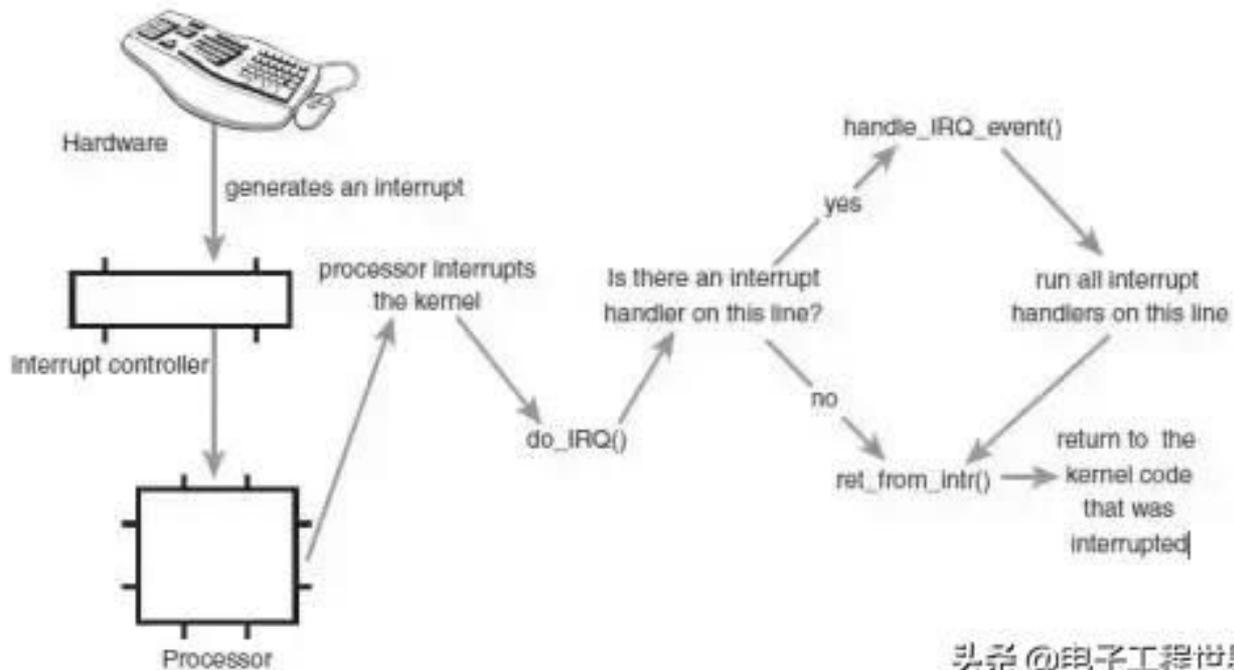
偏移	位元組	0								1								2								3							
位元組	位元	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	來源連接埠																目的連接埠															
4	32	序列號碼																															
8	64	確認號碼 (當ACK設定)																															
12	96	資料偏移				保留 0 0 0			N S	C W R	E C E	U R G	A C K	P S H	R S T	S S T	F I N	窗口大小															
16	128	校驗和																緊急指標 (當URG設定)															
20	160	選項 (如果資料偏移 > 5, 需要在結尾添加0。)																															
...																															

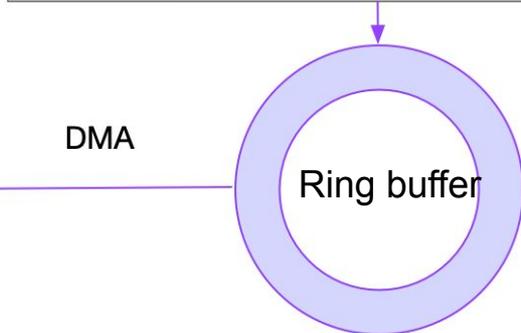
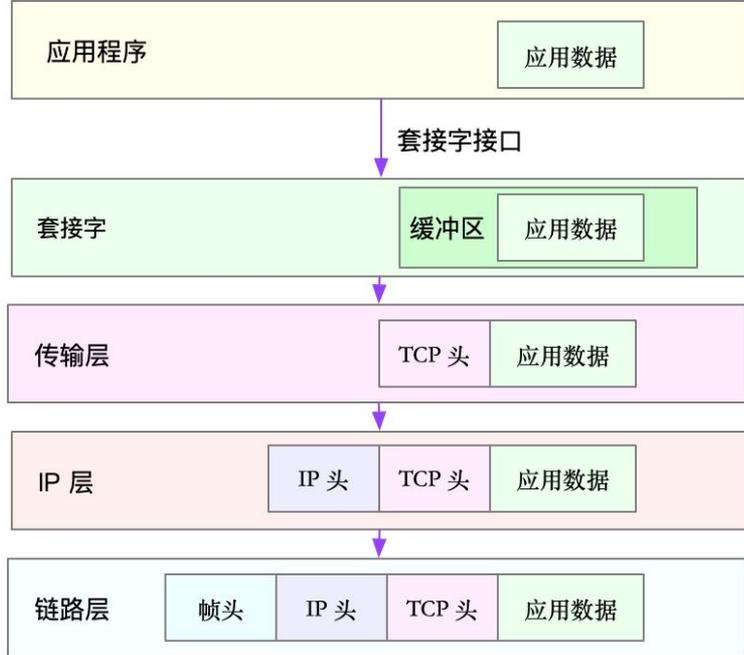
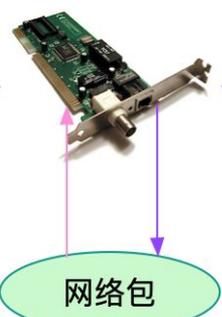
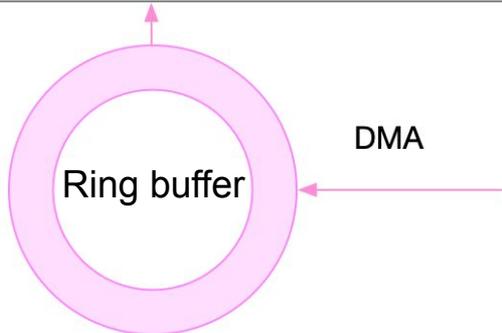
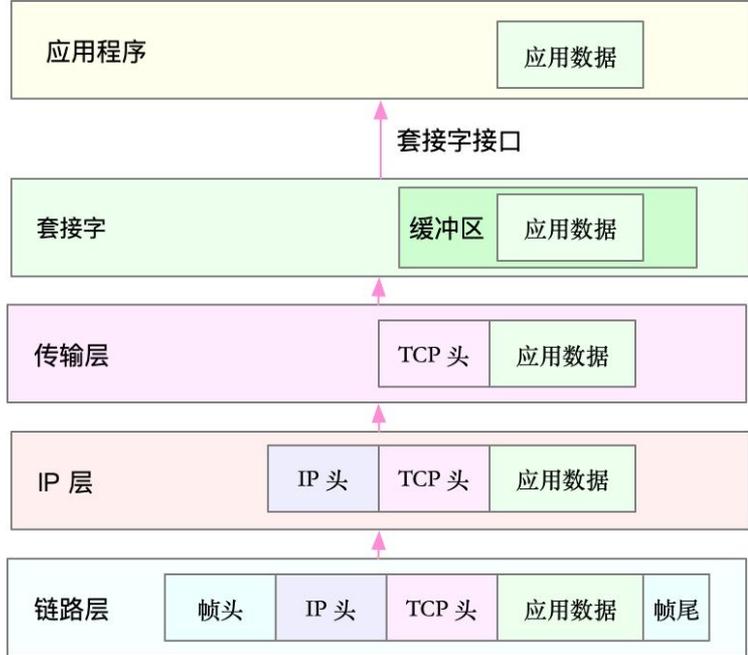
MTU: 最大傳輸單元





軟中斷與硬中斷





補充

Sk_buff一般是说内核数据接口

skb则是套接字缓存(socket buffer)

性能指標 1

- 頻寬，表示網路的最大傳輸速率(Data Rate)，每秒位元數(bps)。
- 吞吐量(Throughput)，表示單位時間內成功傳輸的數據量，單位通常為 b/s (比特 / 秒) 或者 B/s (位元組 / 秒)。吞吐量受頻寬限制，而吞吐量 / 頻寬，也就是該網路的使用率。
- 延遲(Latency)，表示從網路請求發出後，一直到收到遠端響應，所需要的時間延遲。
- PPS，是 Packet Per Second (包 / 秒) 的縮寫，表示以網路包為單位的傳輸速率。

性能指標 2

- 網路可用性 (Network availability), 網路正常運作的時間
- 併發數 (Concurrency), 短時間可以同時處理的請求數
- 丟包率 (Loss Tolerance/packet loss rate), 丟失封包佔發送封包的比率
- 重傳率 (重新傳輸的網路封包比例)

網路配置

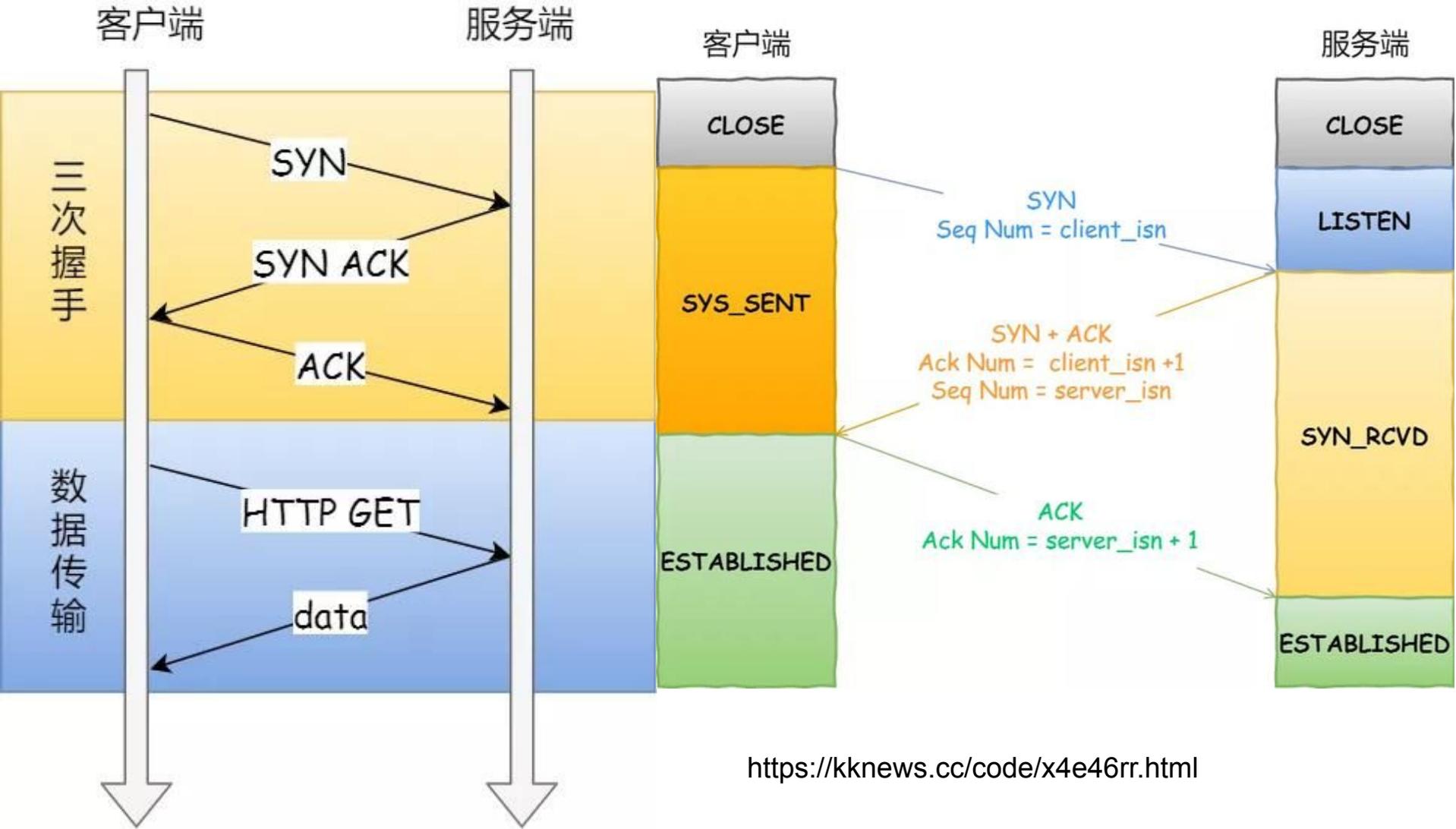
```
root@f938306d7c59:/# ifconfig eth0
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.17.0.2 netmask 255.255.0.0 broadcast 172.17.255.255
    ether 02:42:ac:11:00:02 txqueuelen 0 (Ethernet)
    RX packets 6204 bytes 8967640 (8.5 MiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 2485 bytes 135814 (132.6 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

Socket Information

```
root@airflow-web-7fbccdf754-r2pr4:/usr/local/airflow# netstat -nlp
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 0.0.0.0:8080             0.0.0.0:*                LISTEN      32/gunicorn: master
tcp        0      0 0.0.0.0:80              0.0.0.0:*                LISTEN      -
Active UNIX domain sockets (only servers)
```

协议栈统计信息

```
root@airflow-web-7fbccdf754-r2pr4:/usr/local/airflow# netstat -s
Ip:
    Forwarding: 1
    286161723 total packets received
    0 forwarded
    0 incoming packets discarded
    286159554 incoming packets delivered
    285947593 requests sent out
Icmp:
    0 ICMP messages received
    0 input ICMP message failed
    ICMP input histogram:
    0 ICMP messages sent
    0 ICMP messages failed
    ICMP output histogram:
Tcp:
    429822 active connection openings
    3818126 passive connection openings
    2 failed connection attempts
    95 connection resets received
    10 connections established
    285657313 segments received
    285026050 segments sent out
    542377 segments retransmitted
    12 bad segments received
    120033 resets sent
```



网络吞吐和 PPS

```
root@airflow-web-7fbccdf754-r2pr4:/usr/local/airflow# sar -n DEV 1
Linux 4.9.0-7-amd64 (airflow-web-7fbccdf754-r2pr4)      09/07/20      _x86_64_      (8 CPU)

17:02:08      IFACE  rxpck/s   txpck/s   rxkB/s   txkB/s   rxcmp/s   txcmp/s   rxmcst/s   %ifutil
17:02:09          lo      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
17:02:09      eth0    39.00    36.00     4.02     4.80      0.00      0.00      0.00      0.00

17:02:09      IFACE  rxpck/s   txpck/s   rxkB/s   txkB/s   rxcmp/s   txcmp/s   rxmcst/s   %ifutil
17:02:10          lo      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
17:02:10      eth0    11.00    11.00     1.66     1.49      0.00      0.00      0.00      0.00

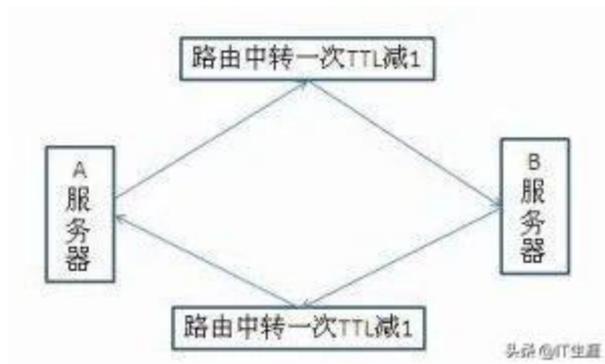
17:02:10      IFACE  rxpck/s   txpck/s   rxkB/s   txkB/s   rxcmp/s   txcmp/s   rxmcst/s   %ifutil
17:02:11          lo      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
17:02:11      eth0    10.00    10.00     0.89     1.03      0.00      0.00      0.00      0.00
```

连通性和延时

```
root@airflow-web-7fbccdf754-r2pr4:/usr/local/airflow# ping -c3 0.0.0.0
PING 0.0.0.0 (127.0.0.1) 56(84) bytes of data.
64 bytes from 127.0.0.1: icmp_seq=1 ttl=64 time=0.024 ms
64 bytes from 127.0.0.1: icmp_seq=2 ttl=64 time=0.026 ms
64 bytes from 127.0.0.1: icmp_seq=3 ttl=64 time=0.025 ms

--- 0.0.0.0 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 42ms
rtt min/avg/max/mdev = 0.024/0.025/0.026/0.000 ms
```

備註：TTL



思考

- 常用什麼指標來衡量網路性能？
- 又什麼方法分析性能問題？
- 如何解決？