docker的虚拟网络环境Geneve隧道在TCP挥手过程丢包问题

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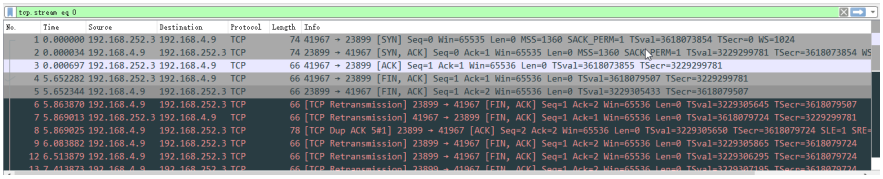
组网及说明



在docker的宿主机和容器将网络通信，可以ping通，但建立的ip:port链接timeout或链接丢失，抓包如图：

问题描述

连接异常网卡信息

ethtool enp3s0f0 Settings for enp3s0f0: Supported ports: [FIBRE] Supported link modes: 10000baseT/Full Supported pause frame use: Symmetric Supports auto-negotiation: No Supported FEC modes: Not reported Advertised link modes: 10000baseT/Full Advertised pause frame use: Symmetric Advertised auto-negotiation: No Advertised FEC modes: Not reported Speed: 10000Mb/s Duplex: Full Port: FIBRE PHYAD: 0 Transceiver: internal Auto-negotiation: off Supports Wake-on: d Wake-on: d Current message level: 0x00000007 (7) drv probe link Link detected: yes # ethtool -i enp3s0f0 driver: txgbe version: 1.1.12 firmware-version: 0x00020004 expansion-rom-version: bus-info: 0000:03:00.0 supports-statistics: yes supports-test: yes supports-eeprom-access: yes supports-register-dump: yes supports-priv-flags: no

连接正常网卡信息

ethtool enp6s0f0 Settings for enp6s0f0: Supported ports: [FIBRE] Supported link modes: 10000baseSR/Full Supported pause frame use: Symmetric Supports auto-negotiation: Yes Supported FEC modes: Not reported Advertised link modes: 10000baseSR/Full Advertised pause frame use: No Advertised auto-negotiation: Yes Advertised FEC modes: Not reported Speed: 10000Mb/s Duplex: Full Port: FIBRE PHYAD: 0 Transceiver: internal Auto-negotiation: off Supports Wake-on: d Wake-on: d Current message level: 0x00000007 (7) drv probe link Link detected: yes 正常主机： # ethtool -i enp6s0f0 driver: i40e version: 2.3.2-k firmware-version: 6.01 0x800035cf 1.1747.0 expansion-rom-version: bus-info: 0000:06:00.0 supports-statistics: yes supports-test: yes supports-eeprom-access: yes supports-register-dump: yes supports-priv-flags: yes

过程分析

当前虚拟化场景下，虚拟网卡均不会对报文进行IP层的checksum校验。导致请求报文的IP层checksum异常，目的服务器拒绝对其请求进行相应。在网卡硬件本身不支持校验数据包功能之前是由Linux内核读取IP数据包校验的，关闭硬件上的校验和功能后，linux内核仍然会对数据包做校验和，不影响数据安全

网卡开启了CheckSum Offload(硬件校验和) 功能，系统将CheckSum的计算工作交由网卡去计算，在高速网络交换的情况下可以减轻CPU的工作负荷。

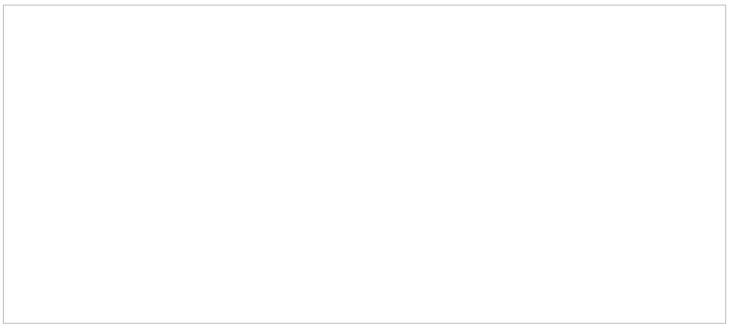
解决方法

解决方法：

1、 统一关闭虚拟port的tx checksum功能，统一让虚拟机或namespace协议栈去计算L4 checksum
执行#ethtool -K eth1 tx off

2、修改应用代码支持硬件CSUM功能，统一设置让出物理网卡的包由硬件CSUM

数据包处理过程说明如下：



COE（Checksum Offload Engine）：支持硬件checksum 计算和校验

更进一步了解相关信息可参考链接

https://huataihuang.gitbooks.io/cloud-atlas/content/network/packet_analysis/tcpdump/udp_tcp_checksum_errors_from_tcpdump_nic_hardware_offloading.html

checksum说明参考

https://datatracker.ietf.org/doc/html/rfc791 #IP协议rfc791说明

https://datatracker.ietf.org/doc/html/rfc1071 #校验和算法rfc1071说明

https://www.intel.com/content/dam/doc/manual/pci-pci-x-family-gbe-controllers-software-dev-manual.pdf

https://www.wireshark.org/docs/wsug_html_chunked/ChAdvChecksums.html

关闭硬件上的校验和功能，对传输数据本身是没有影响的参考如下：

http://docs.gz.ro/node/282

如果网卡不支持则，在linux系统里的TCP/IP协议栈来完成数据校验。

参考链接：

http://docs.gz.ro/tuning-network-cards-on-linux.html