

Prestandautvärdering av Qotom Mini PC Q20331G9 S10

https://www.qotom.net/product/RouterPC_Q20331G9S10.html

Bakgrund

I samband med Sunet-uppgraderingen 2023-2024 ställdes krav på AMPRNet att uppgradera sina Sunet-anslutningar från 1GE/sfp- till 10GE/sfp+-länkar.

Det visade sig svårt att hitta en kommersiell dedikerad router med åtminstone en sfp+-port i en rimlig prisklass jämförbar med den prisklass som Ubiquiti Edgerouter tillhör.

I Stockholmsregionen löstes detta inledningsvis genom att återanvända pensionerade Bifrostroutrar med Tyan och SuperMicro-moderkort donerade av Karolinska Institutet och Uppsala Universitet. Efter en del inkörningsproblem med maskinvarufel under hösten 2023 och övergång från Bifrost, som inte längre underhålls, till VyOS (<https://vyos.org/>), fungerar detta sedan januari 2024 störningsfritt.

Mätningar visar dock att det är önskvärt att hitta mer modern maskinvara. De moderkort som används har alla första generationens PCI-bus, vilket begränsar sfp+-portarna till cirka 5-6 Gbps, effektförbrukningen är hög (~220W) och utrustningen är betydligt större och tyngre än modern utrustning.

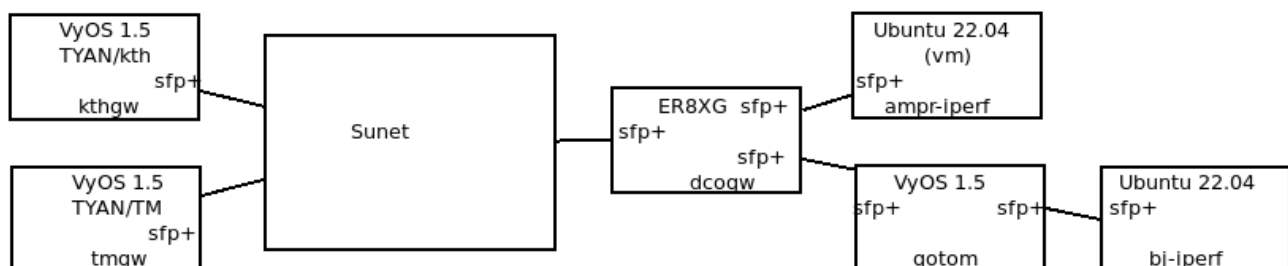
Genom eftersökning på PC-marknaden identifierade Börje/SM2OUY Qotom Mini PC Q20331G9 S10 som intressant att undersöka närmare. Två exemplar anskaffades för prestandatester. Kostnad cirka 3.500 SEK/styck.

Mätningarna redovisade i rapporten har utförts i samarbete över nätet mellan Björn/SA0BXI och Börje/SM2OUY med en fysisk uppställning vid Sunets Datacenter Orion i Kalix.

Mätuppställning

Mätningarna har utförts med verktyget iperf3 (<https://software.es.net/iperf/>).

Qotom-maskinen med VyOS 1.5-rolling-202403250019 placerades för att inledningsvis möjliggöra tester mot kthgw och tmgw, och därefter mellan två lokala Ubuntu 22.04-system för att testa genomströmningskapaciteten på Qotommaskinen. Ett av Ubuntu.systemen (ampr-iperf) kördes på på en vm-server och ett (bj-iperf) på en egen maskin ("bare metal").



Figur 1 Mätuppställning

Parametrar att ta hänsyn till

TCP-bufferstorlekar

Bufferterna i samtliga inblandade system måste rymma alla utestående TCP-paket, för att inte i sig utgöra en begränsning av genomströmningen. Storleken beror av överföringshastighet och avstånd. (<https://fasterdata.es.net/host-tuning/linux/>)

```
cat /proc/sys/net/core/rmem_max=67108864
cat /proc/sys/net/core/wmem_max=67108864
```

Trafikstockning (Congestion control/avoidance)

Flödeskontrollalgoritmen "TCP slow start" har till uppgift att undvika/avveckla trafikstockningar och har utvecklats under åren, nu senast med versionerna

- CUBIC en modifiering av slow-start för långa avstånd <https://www.rfc-editor.org/rfc/rfc8312>

- BBR (Bottleneck Bandwidth and Round-trip propagation time) som inte utgår från att tappade paket nödvändigtvis beror på trafikstockning.

<https://cloud.google.com/blog/products/networking/tcp-bbr-congestion-control-comes-to-gcp-your-internet-just-got-faster>

Vilken algoritm som är bäst varierar. I samtliga våra mätningar gav dock BBR bäst resultat.

<https://blog.apnic.net/2020/01/10/when-to-use-and-not-use-bbr/>

<https://www.gumlet.com/blog/tcp-bbr-vs-cubic-congestion-control>

https://www.uio.no/studier/emner/matnat/ifi/INF5072/v18/inf5072_example1.pdf

En analys av BBR från Esnet: <https://internet2.edu/wp-content/uploads/2022/12/techex22-AdvancedNetworking-ExploringtheBBRv2CongestionControlAlgorithm-Tierney.pdf>

BBR finns med i senare versioner av iPerf3 som finns i vyos 1.5 men inte i VyOS 1.3 LTS

BBR installeras i ubuntu enligt <https://www.linuxbabe.com/ubuntu/enable-google-tcp-bbr-ubuntu> :

```
sysctl net.core.default_qdisc=fq
sysctl net.ipv4.tcp_congestion_control=bbr
```

iperf3

Iperf-kommandot finns beskrivet som en man-sida <https://manpages.org/iperf3>. Det iperf3-kommando som använts i samtliga körningar nedan är

```
iperf3 -V -b 10G -c <mottagaraddress> -P 4 -t 20 -i 5 -o 5 -w 16M
```

Mätresultat

1. kthgw → tmgw

```
[SUM] 0.00-20.00 sec 5.18 GBytes 2.23 Gbits/sec sender
[SUM] 0.00-20.01 sec 5.18 GBytes 2.23 Gbits/sec receiver
CPU Utilization: local/sender 25.9% (0.4u/25.5s), remote/receiver 58.9% (0.7u/58.2s)
```

2. tmgw → kthgw

```
[SUM] 0.00-20.00 sec 8.36 GBytes 3.59 Gbits/sec sender
[SUM] 0.00-20.00 sec 8.37 GBytes 3.60 Gbits/sec receiver
CPU Utilization: local/sender 71.3% (0.6u/70.7s), remote/receiver 65.5% (2.2u/63.3s)
```

3. kthgw → bj-iperf genom dco-qotom

```
[SUM] 0.00-20.00 sec 14.4 GBytes 6.19 Gbits/sec sender
[SUM] 0.00-20.01 sec 14.4 GBytes 6.19 Gbits/sec receiver
CPU Utilization: local/sender 98.1% (0.9%u/97.3%u), remote/receiver 3.8% (0.3%u/3.5%u)
```

4. bj-iperf → kthgw genom dco-qotom

```
[SUM] 0.00-20.00 sec 16.3 GBytes 7.02 Gbits/sec sender
[SUM] 0.00-20.02 sec 16.4 GBytes 7.02 Gbits/sec receiver
CPU Utilization: local/sender 44.5% (2.1%u/42.4%u), remote/receiver 85.5% (0.6%u/84.9%u)
```

5. tmgw → bj-iperf genom dco-qotom

```
[SUM] 0.00-20.01 sec 10.2 GBytes 4.38 Gbits/sec sender
[SUM] 0.00-20.03 sec 10.2 GBytes 4.38 Gbits/sec receiver
CPU Utilization: local/sender 89.4% (0.6%u/88.8%u), remote/receiver 0.8% (0.1%u/0.8%u)
```

6. bj-iperf → tmgw genom dco-qotom

```
[SUM] 0.00-20.00 sec 5.39 GBytes 2.31 Gbits/sec sender
[SUM] 0.00-20.04 sec 5.40 GBytes 2.31 Gbits/sec receiver
CPU Utilization: local/sender 17.1% (0.7%u/16.4%u), remote/receiver 40.0% (0.4%u/39.7%u)
```

7. ampr-iperf → bj-iperf genom dco-qotom

```
[SUM] 0.00-20.00 sec 21.2 GBytes 9.11 Gbits/sec sender
[SUM] 0.00-20.04 sec 21.2 GBytes 9.11 Gbits/sec receiver
CPU Utilization: local/sender 17.5% (0.8%u/16.7%u), remote/receiver 4.6% (0.4%u/4.2%u)
```

8. bj-iperf → ampr-iperf genom dco-qotom

```
[SUM] 0.00-20.00 sec 21.0 GBytes 9.01 Gbits/sec sender
[SUM] 0.00-20.04 sec 21.0 GBytes 9.01 Gbits/sec receiver
CPU Utilization: local/sender 63.0% (3.2%u/59.7%u), remote/receiver 29.7% (1.4%u/28.3%u)
```

9. bj-iperf → dco-qotom med dco-qotom som receiver

```
[SUM] 0.00-20.00 sec 15.4 GBytes 6.63 Gbits/sec sender
[SUM] 0.00-20.03 sec 15.5 GBytes 6.63 Gbits/sec receiver
CPU Utilization: local/sender 99.7% (0.8%u/98.9%u), remote/receiver 2.7% (0.2%u/2.4%u)
```

10. dco-qotom → bj-iperf med dco-qotom som sender

```
[SUM] 0.00-20.00 sec 16.9 GBytes 7.25 Gbits/sec sender
[SUM] 0.00-20.00 sec 16.9 GBytes 7.25 Gbits/sec receiver
CPU Utilization: local/sender 52.2% (2.6%u/49.6%u), remote/receiver 99.5% (0.8%u/98.7%u)
```

11 ampr-iperf → bj-iperf genom dco-qotom via wireguard-tunnel

```
[SUM] 0.00-20.00 sec 3.46 GBytes 1.49 Gbits/sec sender
[SUM] 0.00-20.04 sec 3.47 GBytes 1.49 Gbits/sec receiver
CPU Utilization: local/sender 5.7% (0.1%u/5.6%u), remote/receiver 21.3% (2.5%u/18.9%u)
```

12. ampr-iperf → bj-iperf genom dco-qotom via wireguard-tunnel

```
[SUM] 0.00-20.00 sec 3.76 GBytes 1.62 Gbits/sec sender
[SUM] 0.00-20.04 sec 3.77 GBytes 1.62 Gbits/sec receiver
CPU Utilization: local/sender 18.5% (0.9%u/17.7%u), remote/receiver 0.4% (0.0%u/0.4%u)
```

Slutsatser

Körningarna 1 och 2 mellan kthgw och tmgw och körningarna 3 och 4 samt 5 och 6 mot tmgw visar tydligt existensen av flaskhalsar utan att någon berörd cpu är överbelastad. Förklaringen till detta är sannolikt att maskinvarorna vid kthgw och tmgw båda är äldre moderkort baserade på PCI version1, utan PCI express.

Körningarna 7 och 8 visar att Qotom Mini PC Q20331G9 S10 fungerar nöjaktigt som router mellan två 10GE interface, under förutsättning att den inte gör något annat än routing.

Körningarna 9 och 10 visat att genomströmningen hos Qotom Mini PC Q20331G9 S10 begränsas av cpu-kapaciteten om dataflödet initieras och/eller termineras i den.

Körningarna 11 och 12 visar att genomströmningen hos Qotom Mini PC Q20331G9 S10 begränsas kraftigt av cpu-kapaciteten om den används som en wireguardserver med de två direktanslutna Ubuntu-systemen som wireguardklienter.

Qotom Mini PC Q20331G9 S10 Specifikation

https://www.qotom.net/product/RouterPC_Q20331G9S10.html

```
sa0bxi@dco-quotom:~$ uname -a
```

```
Linux dco-quotom 6.6.22-amd64-vyos #1 SMP PREEMPT_DYNAMIC Sat Mar 23 08:49:24 UTC 2024 x86_64 GNU/Linux
```

```
sa0bxi@dco-quotom:~$ show version
```

```
Version:      VyOS 1.5-rolling-202403250019  
Release train: current
```

```
Built by:     autobuild@vyos.net  
Built on:     Mon 25 Mar 2024 02:22 UTC  
Build UUID:   84776b7b-9db0-4cf4-ac05-9a6fcf1e9128  
Build commit ID: e765407943321f
```

```
Architecture: x86_64  
Boot via:     installed image  
System type:  bare metal
```

```
Hardware vendor: Default string  
Hardware model: QDNV01  
Hardware S/N:   Default string  
Hardware UUID:  03000200-0400-0500-0006-000700080009
```

```
sa0bxi@dco-quotom:~$ cat /proc/cpuinfo
```

```
processor      : 0  
vendor_id     : GenuineIntel  
cpu family    : 6  
model        : 95  
model name    : Intel(R) Atom(TM) CPU C3558R @ 2.40GHz  
stepping     : 1  
microcode    : 0x24  
cpu MHz      : 2400.000  
cache size   : 2048 KB  
physical id  : 0  
siblings     : 4  
core id      : 2  
cpu cores    : 4  
apicid       : 4  
initial apicid : 4  
fpu          : yes  
fpu_exception : yes  
cpuid level  : 21  
wp           : yes  
flags        : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts  
acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs  
bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor  
ds_cpl vmx est tm2 ssse3 sdbg cx16 xtpr pdcm sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer  
aes xsave rdrand lahf_lm 3dnowprefetch cpuid_fault epb cat_l2 ssbd ibrs ibpb stibp tpr_shadow  
flexpriority ept vpid ept_ad fsgsbase tsc_adjust smep erms mpx rdt_a rdseed smap clflushopt intel_pt  
sha_ni xsaveopt xsavec xgetbv1 xsaves dtherm arat pln pts vnmi arch_capabilities  
vmx flags    : vnmi preemption_timer posted_intr invvpid ept_x_only ept_ad ept_1gb flexpriority  
apicv tsc_offset vtpr mtf vapic ept vpid unrestricted_guest vapic_reg vid ple shadow_vmcs  
bugs         : spectre_v1 spectre_v2 spec_store_bypass rfd  
bogomips     : 4800.00  
clflush size : 64  
cache_alignment : 64  
address sizes : 39 bits physical, 48 bits virtual  
power management:
```

```
processor      : 1
vendor_id     : GenuineIntel
cpu family    : 6
model         : 95
model name    : Intel(R) Atom(TM) CPU C3558R @ 2.40GHz
stepping      : 1
microcode     : 0x24
cpu MHz       : 1919.455
cache size    : 2048 KB
physical id   : 0
siblings      : 4
core id       : 6
cpu cores     : 4
apicid        : 12
initial apicid : 12
fpu           : yes
fpu_exception : yes
cpuid level   : 21
wp            : yes
flags         : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts
acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs
bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
ds_cpl vmx est tm2 ssse3 sdbg cx16 xtpr pdcm sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer
aes xsave rdrand lahf_lm 3dnowprefetch cpuid_fault epb cat_l2 ssbd ibrs ibpb stibp tpr_shadow
flexpriority ept vpid ept_ad fsgsbase tsc_adjust smep erms mpx rdt_a rdseed smap clflushopt intel_pt
sha_ni xsaveopt xsavec xgetbv1 xsaves dtherm arat pln pts vnmi arch_capabilities
vmx flags     : vnmi preemption_timer posted_intr invvpid ept_x_only ept_ad ept_1gb flexpriority
apicv tsc_offset vtpr mtf vpic ept vpid unrestricted_guest vpic_reg vid ple shadow_vmcs
bugs          : spectre_v1 spectre_v2 spec_store_bypass rfd
bogomips     : 4800.00
clflush size  : 64
cache_alignment : 64
address sizes : 39 bits physical, 48 bits virtual
power management:
```

```
processor      : 2
vendor_id     : GenuineIntel
cpu family    : 6
model         : 95
model name    : Intel(R) Atom(TM) CPU C3558R @ 2.40GHz
stepping      : 1
microcode     : 0x24
cpu MHz       : 2163.568
cache size    : 2048 KB
physical id   : 0
siblings      : 4
core id       : 8
cpu cores     : 4
apicid        : 16
initial apicid : 16
fpu           : yes
fpu_exception : yes
cpuid level   : 21
wp            : yes
flags         : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts
acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs
bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
ds_cpl vmx est tm2 ssse3 sdbg cx16 xtpr pdcm sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer
aes xsave rdrand lahf_lm 3dnowprefetch cpuid_fault epb cat_l2 ssbd ibrs ibpb stibp tpr_shadow
flexpriority ept vpid ept_ad fsgsbase tsc_adjust smep erms mpx rdt_a rdseed smap clflushopt intel_pt
sha_ni xsaveopt xsavec xgetbv1 xsaves dtherm arat pln pts vnmi arch_capabilities
vmx flags     : vnmi preemption_timer posted_intr invvpid ept_x_only ept_ad ept_1gb flexpriority
apicv tsc_offset vtpr mtf vpic ept vpid unrestricted_guest vpic_reg vid ple shadow_vmcs
bugs          : spectre_v1 spectre_v2 spec_store_bypass rfd
bogomips     : 4800.00
clflush size  : 64
cache_alignment : 64
address sizes : 39 bits physical, 48 bits virtual
power management:
```

```
processor      : 3
vendor_id     : GenuineIntel
cpu family    : 6
model         : 95
model name    : Intel(R) Atom(TM) CPU C3558R @ 2.40GHz
stepping      : 1
```

```

microcode      : 0x24
cpu MHz        : 2400.046
cache size     : 2048 KB
physical id    : 0
siblings       : 4
core id        : 12
cpu cores      : 4
apicid         : 24
initial apicid : 24
fpu            : yes
fpu_exception : yes
cpuid level    : 21
wp             : yes
flags          : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts
acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs
bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
ds_cpl vmx est tm2 ssse3 sdbg cx16 xtpr pdcm sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer
aes xsave rdrand lahf_lm 3dnowprefetch cpuid_fault epb cat_l2 ssbd ibrs ibpb stibp tpr_shadow
flexpriority ept vpid ept_ad fsgsbase tsc_adjust smep erms mpx rdt_a rdseed smap clflushopt intel_pt
sha_ni xsaveopt xsavec xgetbv1 xsaves dtherm arat pln pts vnmi arch_capabilities
vmx flags      : vnmi preemption_timer posted_intr invvpid ept_x_only ept_ad ept_1gb flexpriority
apicv tsc_offset vtptr mtf vapic ept vpid unrestricted_guest vapic_reg vid ple shadow_vmcs
bugs           : spectre_v1 spectre_v2 spec_store_bypass rfds
bogomips       : 4800.00
clflush size   : 64
cache_alignment : 64
address sizes  : 39 bits physical, 48 bits virtual
power management:

```

```
sa0bxi@dco-quotom:~$ cat /proc/meminfo
```

```

MemTotal:      16366328 kB
MemFree:       15413428 kB
MemAvailable:  15560060 kB
Buffers:       17076 kB
Cached:        378196 kB
SwapCached:    0 kB
Active:        156040 kB
Inactive:      414964 kB
Active(anon):  2488 kB
Inactive(anon): 180260 kB
Active(file):  153552 kB
Inactive(file): 234704 kB
Unevictable:   15804 kB
Mlocked:      15804 kB
SwapTotal:     0 kB
SwapFree:      0 kB
Dirty:         8 kB
Writeback:     0 kB
AnonPages:    191536 kB
Mapped:        67364 kB
Shmem:         3260 kB
KReclaimable: 31384 kB
Slab:          71520 kB
SReclaimable: 31384 kB
SUnreclaim:   40136 kB
KernelStack:  3504 kB
PageTables:    2960 kB
SecPageTables: 0 kB
NFS_Unstable: 0 kB
Bounce:        0 kB
WritebackTmp: 0 kB
CommitLimit:  8183164 kB
Committed_AS: 582528 kB
VmallocTotal: 34359738367 kB
VmallocUsed:   18796 kB
VmallocChunk:  0 kB
Percpu:        1776 kB
HardwareCorrupted: 0 kB
AnonHugePages: 57344 kB
ShmemHugePages: 0 kB
ShmemPmdMapped: 0 kB
FileHugePages: 0 kB
FilePmdMapped: 0 kB
CmaTotal:      0 kB
CmaFree:       0 kB
HugePages_Total: 0
HugePages_Free: 0

```

```
HugePages_Rsvd:      0
HugePages_Surp:      0
Hugepagesize:        2048 kB
Hugetlb:              0 kB
DirectMap4k:         128972 kB
DirectMap2M:         4036608 kB
DirectMap1G:         14680064 kB
```

```
sa0bxi@dco-quotom:~$ lspci
```

```
00:00.0 Host bridge: Intel Corporation Atom Processor C3000 Series System Agent (rev 11)
00:04.0 Host bridge: Intel Corporation Atom Processor C3000 Series Error Registers (rev 11)
00:05.0 Generic system peripheral [0807]: Intel Corporation Atom Processor C3000 Series Root Complex Event Collector (rev 11)
00:06.0 PCI bridge: Intel Corporation Atom Processor C3000 Series Integrated QAT Root Port (rev 11)
00:09.0 PCI bridge: Intel Corporation Atom Processor C3000 Series PCI Express Root Port #0 (rev 11)
00:0a.0 PCI bridge: Intel Corporation Atom Processor C3000 Series PCI Express Root Port #1 (rev 11)
00:0b.0 PCI bridge: Intel Corporation Atom Processor C3000 Series PCI Express Root Port #2 (rev 11)
00:0c.0 PCI bridge: Intel Corporation Atom Processor C3000 Series PCI Express Root Port #3 (rev 11)
00:0e.0 PCI bridge: Intel Corporation Atom Processor C3000 Series PCI Express Root Port #4 (rev 11)
00:0f.0 PCI bridge: Intel Corporation Atom Processor C3000 Series PCI Express Root Port #5 (rev 11)
00:10.0 PCI bridge: Intel Corporation Atom Processor C3000 Series PCI Express Root Port #6 (rev 11)
00:11.0 PCI bridge: Intel Corporation Atom Processor C3000 Series PCI Express Root Port #7 (rev 11)
00:12.0 System peripheral: Intel Corporation Atom Processor C3000 Series SMBus Contoller - Host (rev 11)
00:13.0 SATA controller: Intel Corporation Atom Processor C3000 Series SATA Controller 0 (rev 11)
00:14.0 SATA controller: Intel Corporation Atom Processor C3000 Series SATA Controller 1 (rev 11)
00:15.0 USB controller: Intel Corporation Atom Processor C3000 Series USB 3.0 xHCI Controller (rev 11)
00:16.0 PCI bridge: Intel Corporation Atom Processor C3000 Series Integrated LAN Root Port #0 (rev 11)
00:17.0 PCI bridge: Intel Corporation Atom Processor C3000 Series Integrated LAN Root Port #1 (rev 11)
00:18.0 Communication controller: Intel Corporation Atom Processor C3000 Series ME HECI 1 (rev 11)
00:1a.0 Serial controller: Intel Corporation Atom Processor C3000 Series HSUART Controller (rev 11)
00:1f.0 ISA bridge: Intel Corporation Atom Processor C3000 Series LPC or eSPI (rev 11)
00:1f.2 Memory controller: Intel Corporation Atom Processor C3000 Series Power Management Controller (rev 11)
00:1f.4 SMBus: Intel Corporation Atom Processor C3000 Series SMBus controller (rev 11)
00:1f.5 Serial bus controller: Intel Corporation Atom Processor C3000 Series SPI Controller (rev 11)
01:00.0 Co-processor: Intel Corporation Atom Processor C3000 Series QuickAssist Technology (rev 11)
02:00.0 Non-Volatile memory controller: Phison Electronics Corporation PS5013 E13 NVMe Controller (rev 01)
04:00.0 Ethernet controller: Intel Corporation Ethernet Controller I225-V (rev 03)
05:00.0 Ethernet controller: Intel Corporation Ethernet Controller I225-V (rev 03)
06:00.0 Ethernet controller: Intel Corporation Ethernet Controller I225-V (rev 03)
07:00.0 Ethernet controller: Intel Corporation Ethernet Controller I225-V (rev 03)
08:00.0 Ethernet controller: Intel Corporation Ethernet Controller I225-V (rev 03)
09:00.0 PCI bridge: ASPEED Technology, Inc. AST1150 PCI-to-PCI Bridge (rev 03)
0a:00.0 VGA compatible controller: ASPEED Technology, Inc. ASPEED Graphics Family (rev 30)
0b:00.0 Ethernet controller: Intel Corporation Ethernet Connection X553 10 GbE SFP+ (rev 11)
0b:00.1 Ethernet controller: Intel Corporation Ethernet Connection X553 10 GbE SFP+ (rev 11)
0c:00.0 Ethernet controller: Intel Corporation Ethernet Connection X553 Backplane (rev 11)
0c:00.1 Ethernet controller: Intel Corporation Ethernet Connection X553 Backplane (rev 11)
```

```
sa0bxi@dco-quotom:~$ sudo dmidecode |grep -i pci
```

```
PCI is supported
Internal Reference Designator: J9C1 - PCIE DOCKING CONN
Type: x8 PCI Express 3 x8
Type: x4 PCI Express 3 x4
Type: x4 PCI Express 3 x4
Descriptor 9: PCI parity error
Descriptor 10: PCI system error
```

```
sa0bxi@dco-quotom:~$
```