

# ARM Cache Coherent Network

CCN-504 is a ring-bus interconnect consisting of 11 crosspoints (XPs), with each crosspoint supporting up to two device ports, so nodes (devices) 0 and 1 are connected to crosspoint 0, nodes 2 and 3 to crosspoint 1 etc.

## PMU (perf) driver

The CCN driver registers a perf PMU driver, which provides description of available events and configuration options in sysfs, see `/sys/bus/event_source/devices/ccn*`.

The "format" directory describes format of the `config`, `config1` and `config2` fields of the `perf_event_attr` structure. The "events" directory provides configuration templates for all documented events, that can be used with perf tool. For example "xp\_valid\_flit" is an equivalent of "type=0x8,event=0x4". Other parameters must be explicitly specified.

For events originating from device, "node" defines its index.

Crosspoint PMU events require "xp" (index), "bus" (bus number) and "vc" (virtual channel ID).

Crosspoint watchpoint-based events (special "event" value 0xfe) require "xp" and "vc" as above plus "port" (device port index), "dir" (transmit/receive direction), comparator values ("cmp\_l" and "cmp\_h") and "mask", being index of the comparator mask.

Masks are defined separately from the event description (due to limited number of the config values) in the "cmp\_mask" directory, with first 8 configurable by user and additional 4 hardcoded for the most frequent use cases.

Cycle counter is described by a "type" value 0xff and does not require any other settings.

The driver also provides a "cpumask" sysfs attribute, which contains a single CPU ID, of the processor which will be used to handle all the CCN PMU events. It is recommended that the user space tools request the events on this processor (if not, the `perf_event->cpu` value will be overwritten anyway). In case of this processor being offlined, the events are migrated to another one and the attribute is updated.

Example of perf tool use:

```
/ # perf list | grep ccn
ccn/cycles/                                [Kernel PMU event]
<...>
ccn/xp_valid_flit,xp=?,port=?,vc=?,dir=?/   [Kernel PMU event]
<...>

/ # perf stat -a -e ccn/cycles/,ccn/xp_valid_flit,xp=1,port=0,vc=1,dir=1/ \
                                                    sleep 1
```

The driver does not support sampling, therefore "perf record" will not work. Per-task (without "-a") perf sessions are not supported.