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AILabs & TVM

CONTENT

PART 1 ： ARM32 CPU

PART 2 ： HIFI4 DSP

PART 3 ： PowerVR GPU

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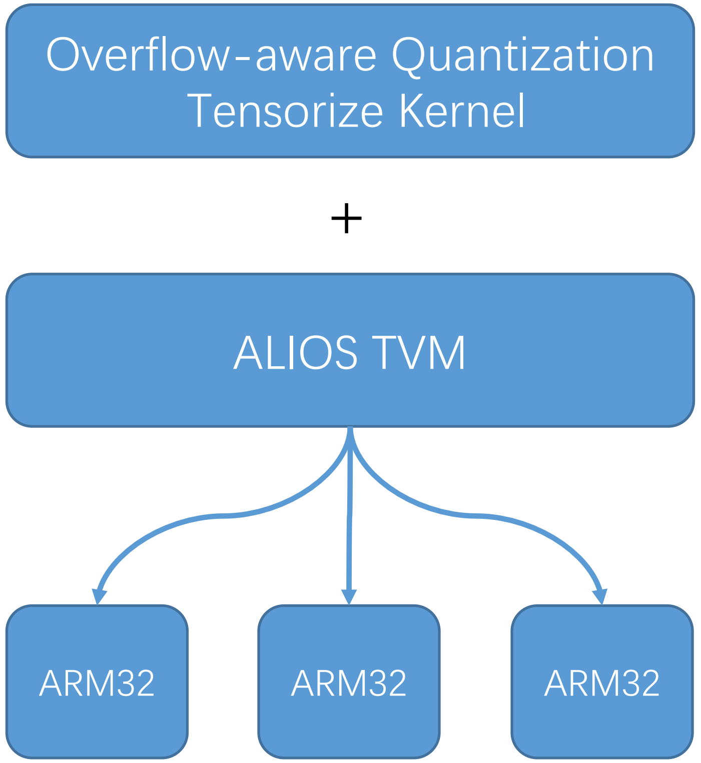
ARM 32 CPU

Resolution



$$r = S(q - Z)$$

$$r_3^{(m,n)} = \sum_{i=1}^{k} r_1^{(m,i)} r_2^{(i,n)}$$

$$q_3^{(m,n)} = Z_3 + 2^{-n} * M_0 \left[\sum_{i=1}^{k} \left(q_1^{(m,i)} (q_2^{(i,n)} - Z_2)\right) + C\right]$$

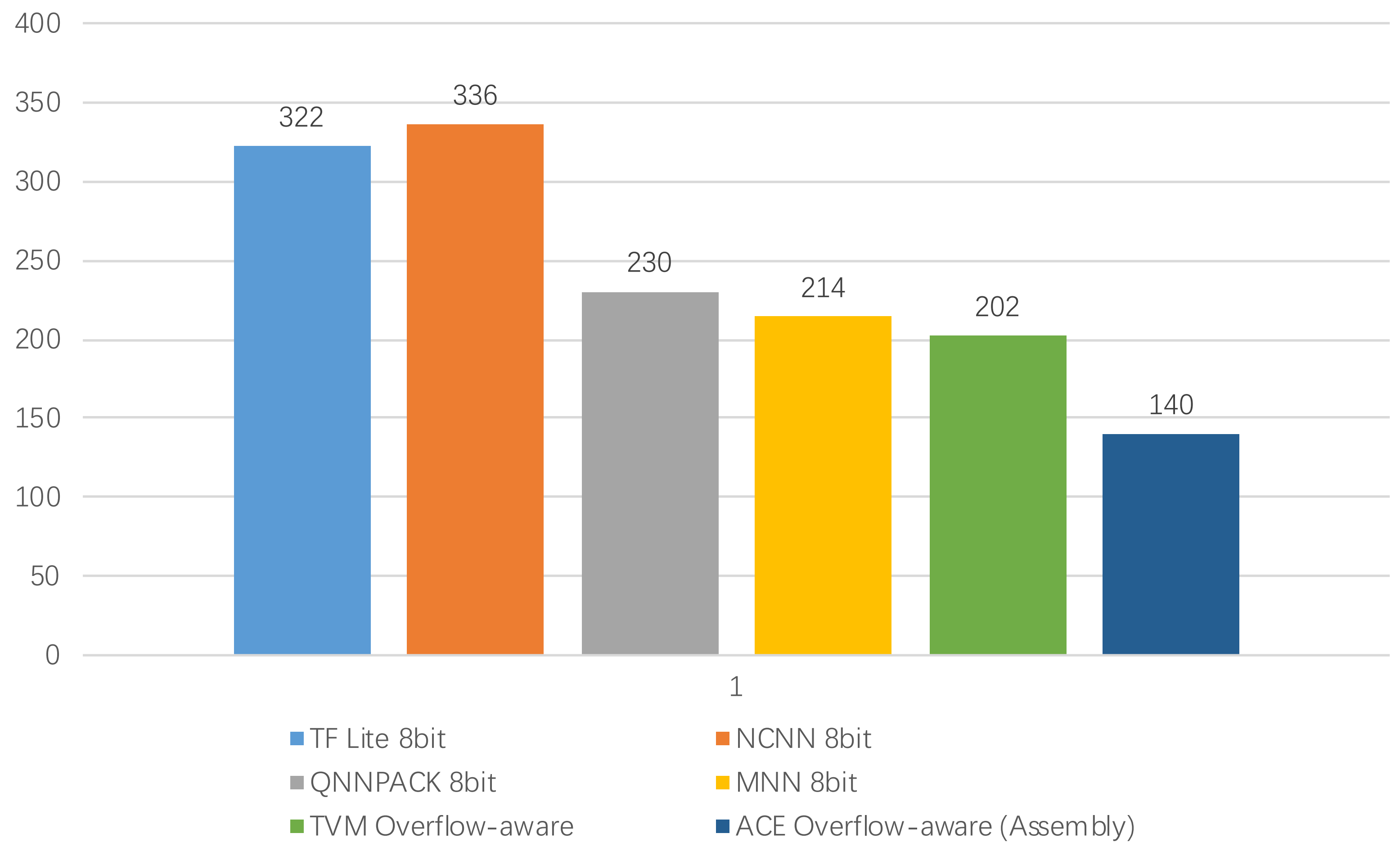
Current plan 1
int32 = int16 * int16

Current plan 2
int16_1 = int8 * int8
int16_2 = int8 * int8
int32 = int16_1 + int16_2

Overflow-aware
int16 = int8 * int8

Result

CPU：MTK8167S（ARM32 A35 1.5GHz）
Model：MobileNetV2_1.0_224



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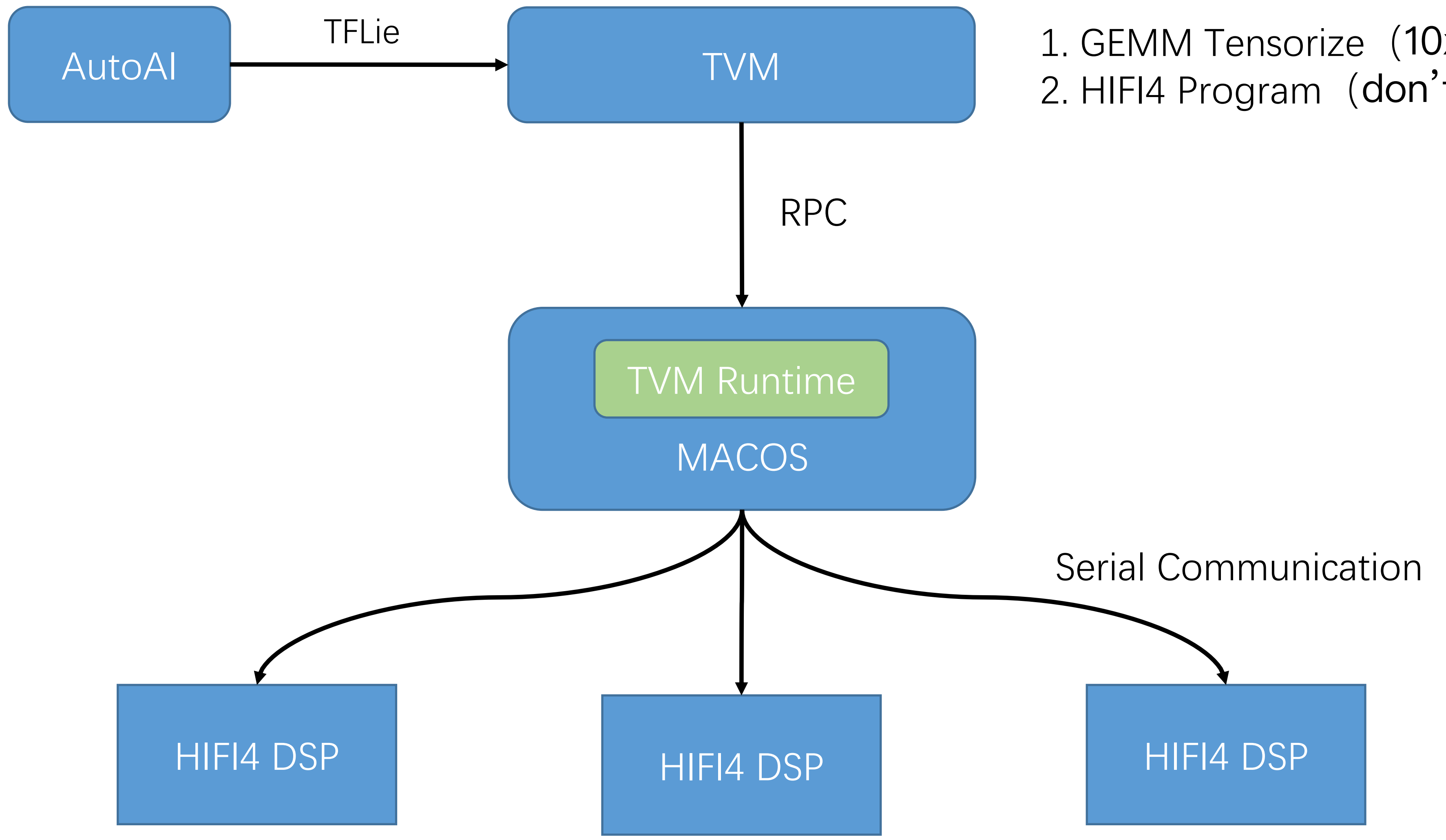
HIFI 4

Resolution



1. GEMM Tensorize（10x speed up）
2. HIFI4 Program（don’t need dlopen）

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PowerVR GPU

PowerVR support by TVM

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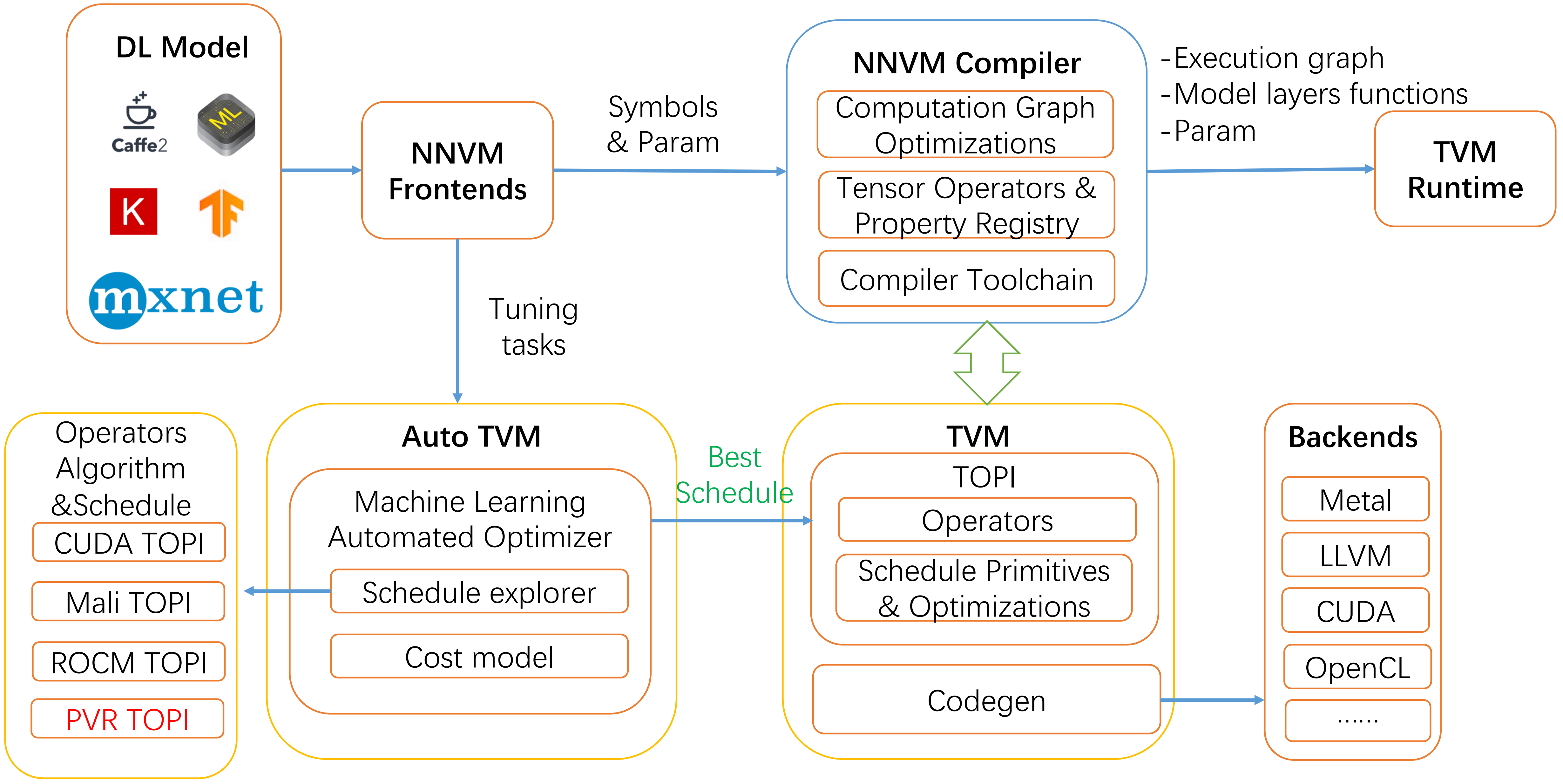

PVR TOPI

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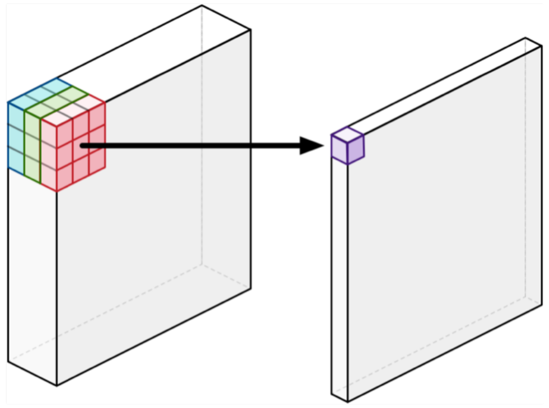
➢ TOPI for PVR, including what you want to compute and how to compute.

✓ What you want to compute

```
@autotvm.register_topi_compute(conv2d, 'pvr', ['direct'])
def conv2d_pvr(cfg, data, kernel, strides, padding, dilation, layout, out_dtype):
    #Describe algorithm with tensor expression language;
    #Return the out operation
```



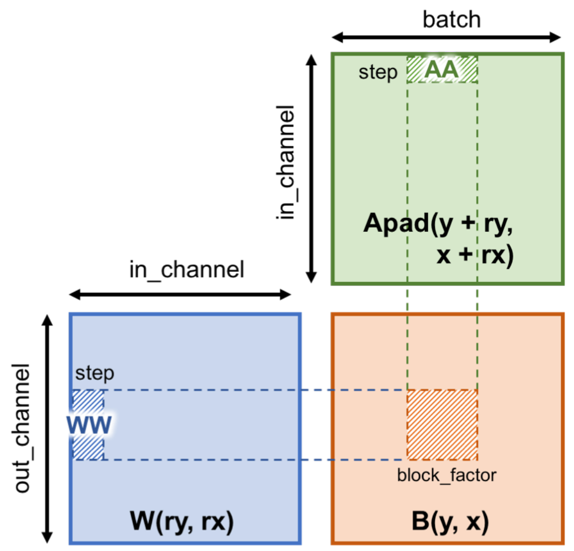
convolution

✓ How to compute.

```
@autotvm.register_topi_schedule(schedule_conv2d_nchw, 'pvr', ['direct'])
def schedule_conv2d_nchw_pvr(cfg, outs):
    #Describe how to compute output by primitive
```

Blocking
splits the workload into thread blocks and individual threads

Cooperative Fetching
lets threads in the same thread block cooperatively fetch dependent data



https://docs.tvm.ai/

PVR TOPI

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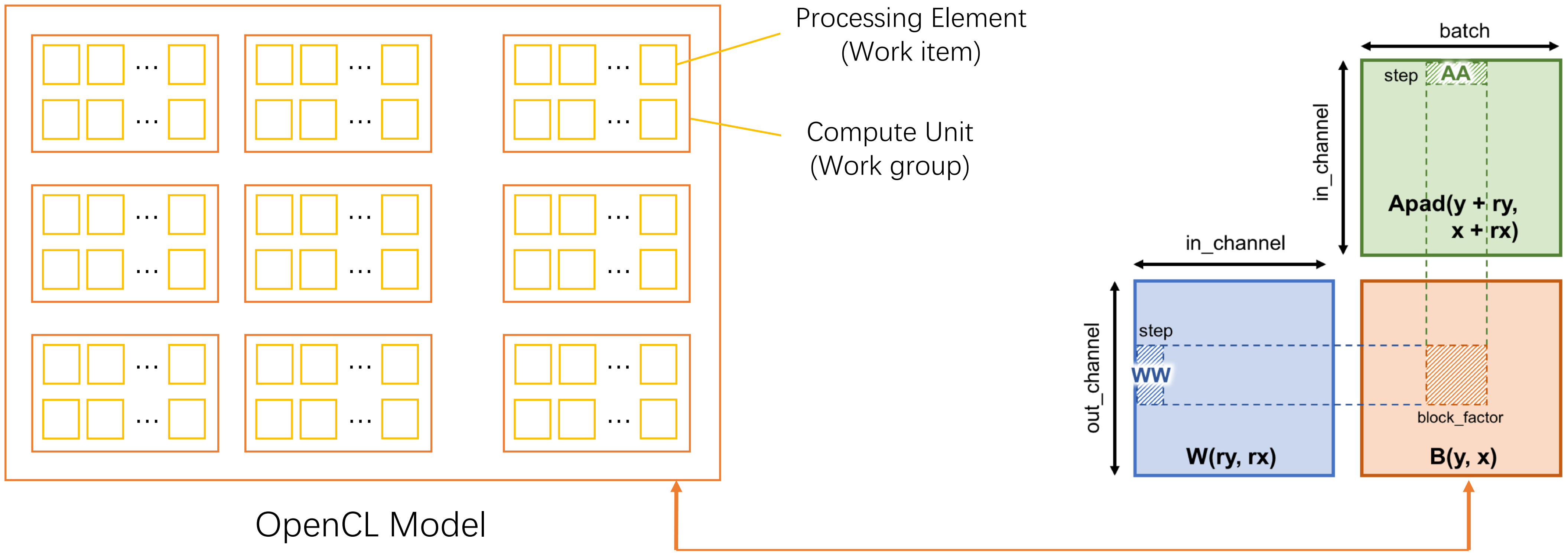
Blocking

Splits the workload into thread blocks (work groups) and individual threads (work items)



Cooperative Fetching

Lets threads (work item) in the same thread block (work group) cooperatively fetch dependent data

https://www.khronos.org/registry/OpenCL/specs/opencl-1.2.pdf

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Thanks