Integrate TVM With MediaTek Neuropilot for Mobile Devices

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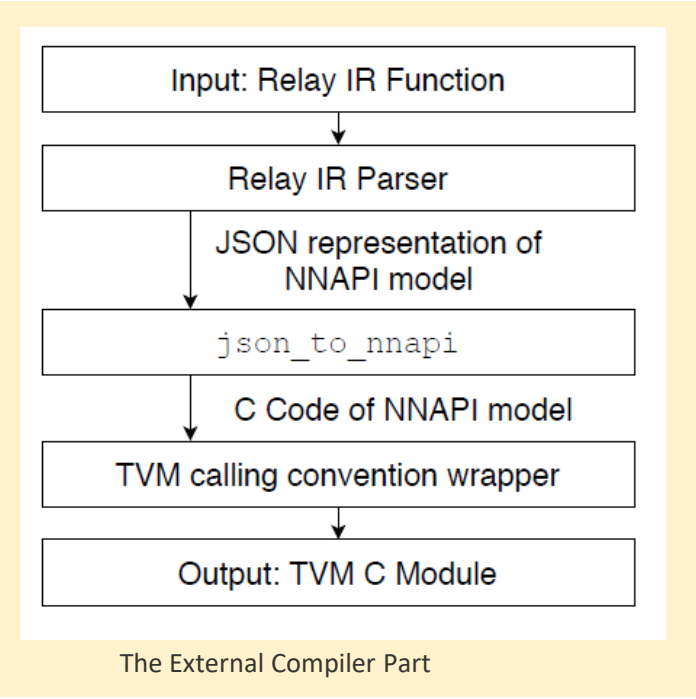
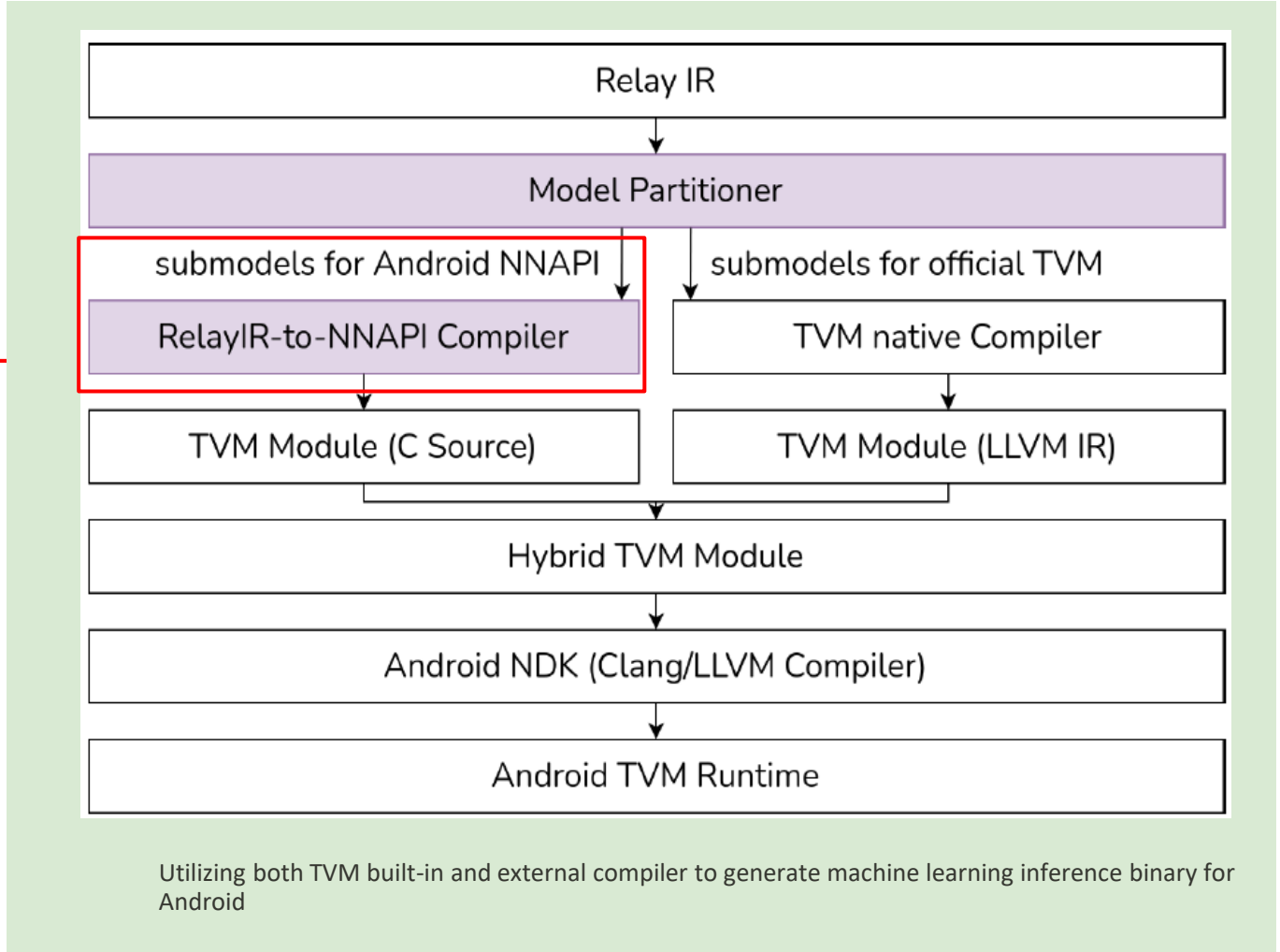
Outline

- Previous presentation: Applying TVM Bring-Your-Own-Codegen to Android NNAPI
- Introducing MediaTek Neuron
- Utilizing MediaTek Neuron with TVM Bring-Your-Own-Codegen
- Experiment
- Summary

Previous Presentation : Applying TVM BYOC to Android NNAPI



The External Compiler Part

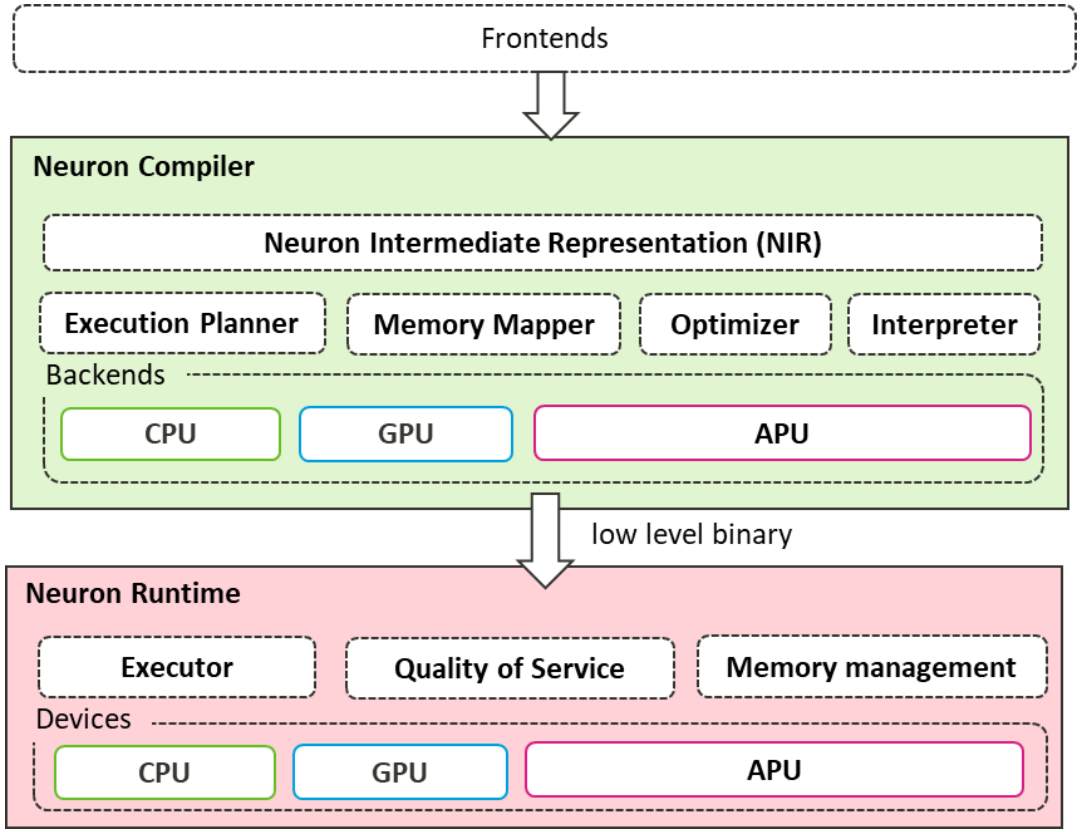


Utilizing both TVM built-in and external compiler to generate machine learning inference binary for Android

TVM RFC - Relay to NNAPI
https://discuss.tvm.apache.org/t/rfc-byoc-android-nnapi-integration/9072

Introducing MediaTek Neuron

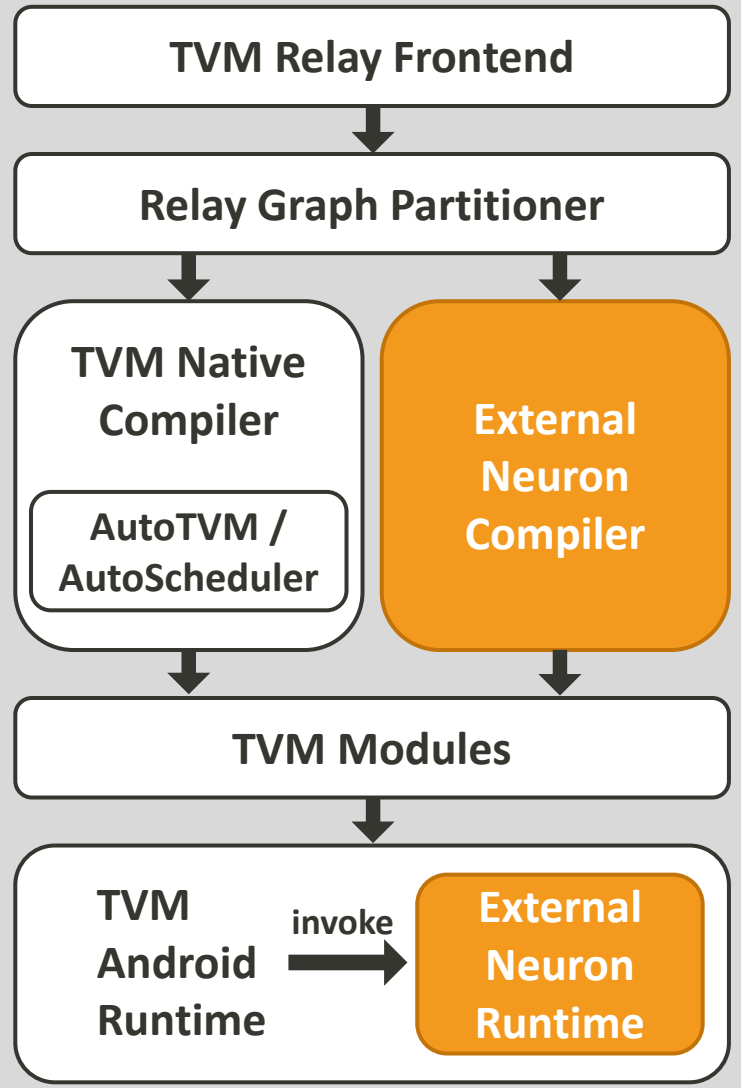
- **MediaTek Neuron is an AI Solution for MediaTek platform**
  - **Neuron Compiler**
    - Support multiple frontend
    - Provide high level graph IR
    - Common graph optimization
    - Partition graph to heterogeneous target like cpu, gpu, apu
  - **Neuron Runtime**
    - Provides APIs to load low-level binary generated by Neuron Compiler
    - Handle device switch, control flow, memory allocate, etc



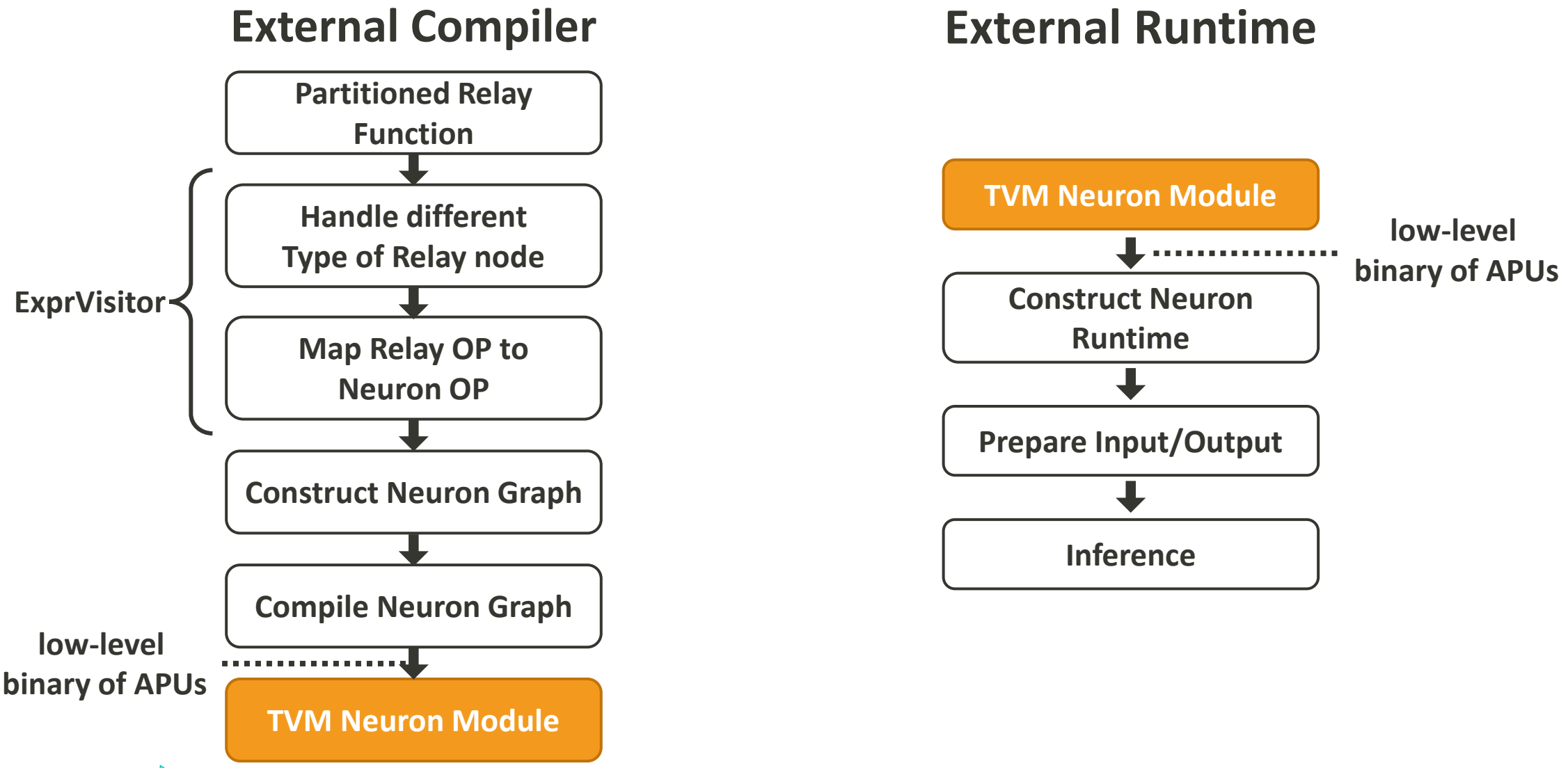
Utilizing MediaTek Neuron with TVM BYOC

- BYOC allow developers to define their own partition rules and offload subgraph to the external compiler.

- Subgraphs left in the TVM compilation flow can still benefit from AutoTVM / AutoScheduler.



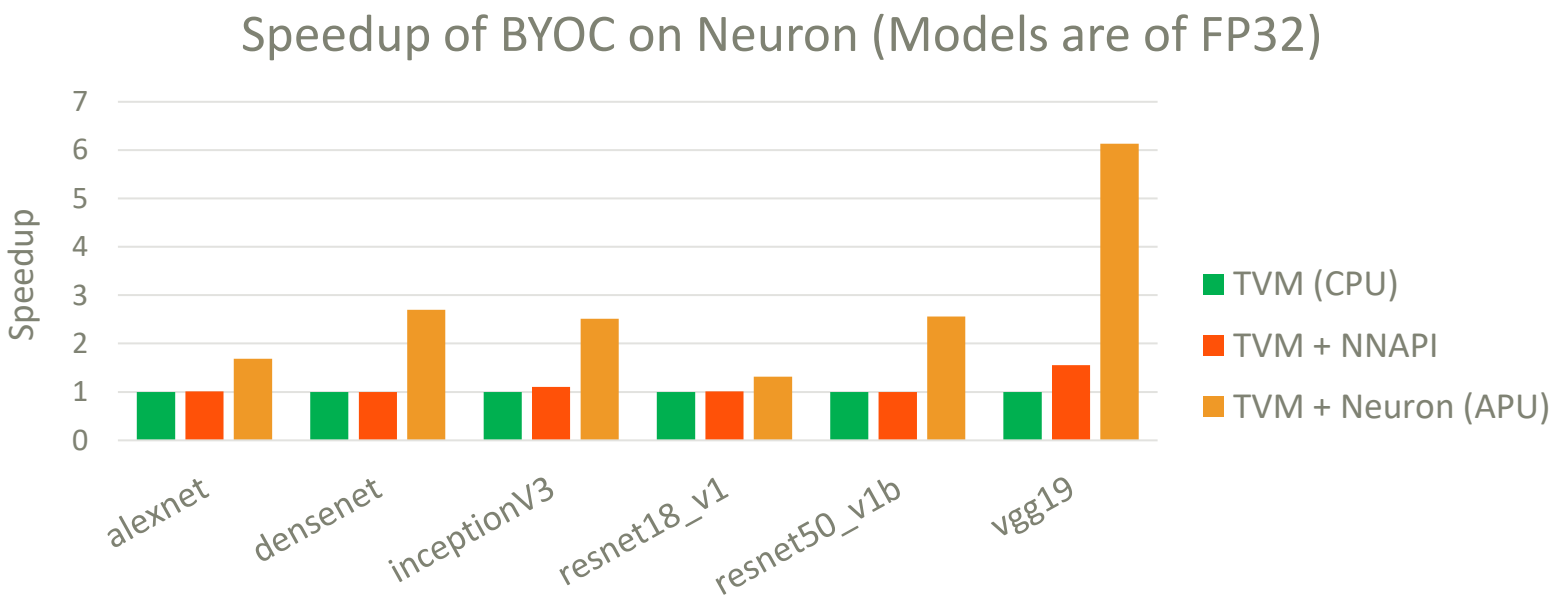
Utilizing MediaTek Neuron with TVM BYOC – Detail

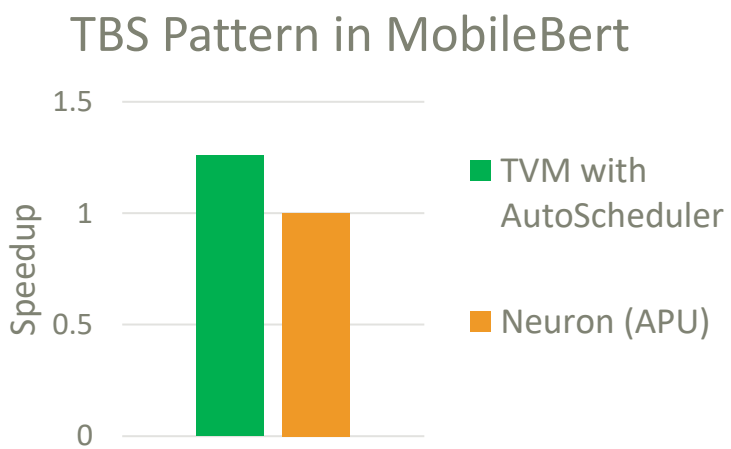


Experiment

Environment: MTK Dimensity 800 5G chip

- **Up to 6X speedup comparing to native TVM and NNAPI Flow**





TBS = 2 * transpose + batch_matmul + softmax

Neuron Advantage

- can use APU to accelerate inference on android device

TVM Advantage

- faster support to new OP and model
- more frontend supporting

Summary

- We enabled TVM BYOC flow to MediaTek Neuron for mobile devices
  - With this flow, developer can use MediaTek APU to accelerate inference.
  - Experiment shows that we have 6X speedup compared to native TVM and NNAPI Flow .
  - How to effectively find the best partition method is a topic that’s worth to research in the future.

STANDARD

Thank you

Questions and Discussions