# DRP-AI Translator V1.81

Release Note

## Introduction

This release note describes the improvements of the DRP-AI Translator.

## Key Features and Enhancements

- Update attribute of Pad
- Relax restrictions of Conv 7x7 and Conv 3x3

## Contents

# 1. Improvements

## 1.1 Operator Attribute Update

New attributes are now supported for the operators below. Please refer to Section4 of User's Manual for more details.

- Pad : "pads" and "constant_value" attributes are newly supported.

## 1.2 Relax Restriction

The following operator is improved the data size restrictions. Please refer to Section4 of User's Manual for more details.

- Convolution 7x7 stride 2 : removed feature map restrictions
- Convolution 3x3 stride 1 pad 1 : improved minimum plane size restriction of feature map

# 2. Fixed Issues

## 2.1 Bug Fix

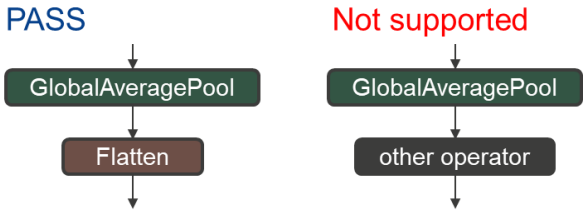
- Fixed the issue where DRP-AI object file was not generated correctly when certain combinations of heigh/width/input channel/output channel are used.
- Fixed the issue on following graph structure:
  Conv > BatchNormalization > HardSwish

# 3. Known Issues

## 3.1 Unsupported Graph Structures

DRP-AI Translator now does not support ONNX with the graph structure described below.

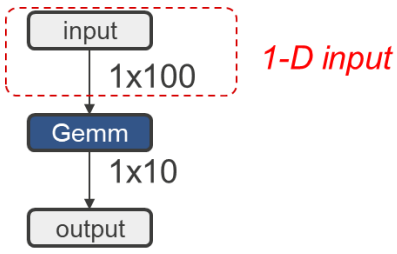
- Graph structure where GlobalAveragePool is connected to other than "Flatten" operator.




- To translate 1-D input onnx model, "-PrePostFULL" option is required.
  - e.g.

```
$ ./run_DRP-AI_translator_V2M.sh <prefix> -onnx <onnx file> \
                                 -prepost <prepost.yaml> -addr <addrmap.yaml> \
                                 -PrePostFULL
```

  - example of 1-D input onnx model



## Appendix 1. How to use python sample scripts

From DRP-AI Translator V1.80, python APIs and its sample scripts have been provided to improve development environment. The features are followings:

- Help to make input files for DRP-AI Translator
  Pre & Post definition and address map definition file can be generated by python APIs.
- Support to run simulation including Pre & Postprocessing by DRP
  It is possible to check the execution result before execution on the device.

The following two types of code are included as sample scripts in the DRP-AI Translator package.

1. Sample script to run DRP-AI Translator
   - Generate pre & post definition file(.yaml) & address map definition file (.yaml) by python script
   - Call DRP-AI Translator on python script
2. Sample script to run simulation including DRP pre & post processing
   - Simulate pre & post processing on python script
   - Simulate AI model inference by onnxruntime

[Note] These functions are beta version. The features and APIs subject to change. Also, the simulation does not guarantee a complete match with the results from the device.

## 1. How to use running DRP-AI Translator script

- This section will explain the included sample code. The file name is below:

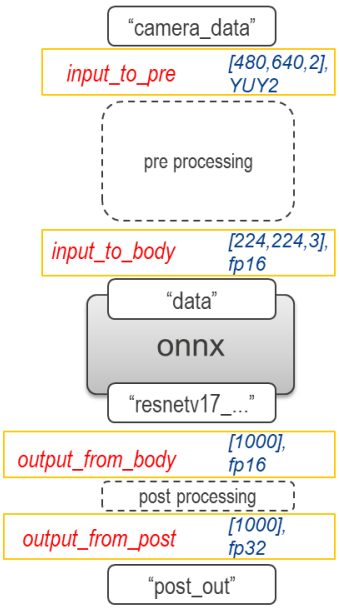
  <install dir>/UserConfig/sample_scripts/run_translator_sample_resnet50.py
- The steps to run the DRP-AI_Translator are as follows.
  A) Define and set pre & post nodes information to drp_prepost class
  B) Define and set pre & post processing classes to drp_prepost class
  C) Save pre & post definition file
  D) Initialize DRP-AI Translator class
  E) Make address map definition file & save
  F) Run DRP-AI Translator
- Before running sample script, please set environment variable(TRANSLATOR) to the directory where you installed DRP-AI Translator.

  e.g. $export TRANSLATOR=/home/user/drp-ai_translator_release/

### A) Define and set pre & post nodes information to drp_prepost class

At first, define input & output node information about onnx model and pre & post processing

```
pp = drp_prepost()
pp.set_input_to_body("data", shape=[224,224,3],
                     order="HWC",type="fp16",format="RGB")
pp.set_input_to_pre("camera_data", shape=[480,640,2],
                     order="HWC",type="uint8",format="YUY2")
pp.set_output_from_body("resnetv17_dense0_fwd",
                     shape=[1000],order="C",type="fp16")
pp.set_output_from_post("post_out",
                     shape=[1000],order="C",type="fp32")
```




**B) Define and set pre & post processing classes to drp_prepost class**

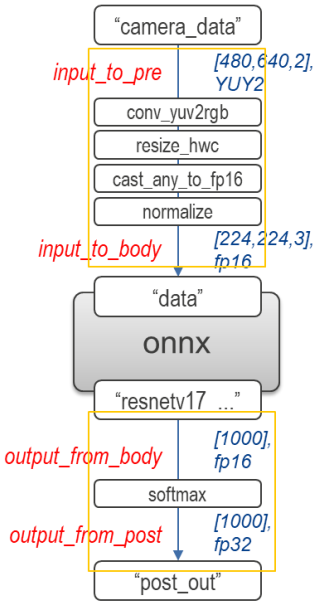
Next, initialize pre & post processing class, and get its instance object. Please refer section 4-2 in User's Manual about parameters of each process. To define sequence order of pre & post processing, make list data which stored instances. Then set pre & post processing sequence to drp_prepost class instance.

```
pre1_conv_yuv2rgb = conv_yuv2rgb(DOUT_RGB_FORMAT=0)
pre2_resize_hwc   = resize_hwc(shape_out=[224,224],RESIZE_ALG=1)
pre3_cast         = cast_any_to_fp16()
pre4_normalize    = normalize(cof_add=[-123.675, -116.28, -103.53],\
                              cof_mul= [0.01712475, 0.017507, 0.01742919])

post1_softmax     = softmax(DOUT_FORMAT=1)

pre_sequence  = [pre1_conv_yuv2rgb,pre2_resize_hwc,pre3_cast,pre4_normalize]
post_sequence = [post1_softmax]

pp.set_preprocess_sequence(src=["camera_data"],dest=["data"],pp_seq=pre_sequence)
pp.set_postprocess_sequence(src=["resnetv17_dense0_fwd"],dest=["post_out"],pp_seq=post_sequence)
```




**C) Save pre & post definition file**

To check setting of pre & post processing definition, show_param() function can be used. The result will show on the console. And by using save() function, pre & post processing definition file is saved.

```
# show setting info
pp.show_params()

# Save data as yaml file
pp.save("output.yaml")
```

```

# Initialize DRP-AI Transaltor class
drp_tran = drp_ai_translator()

# Choose device of run script
drp_tran.set_translator("V2M")

# Make address map file
drp_tran.make_addrfile("0x5F000000",addr_file="./addr_map.yaml")
```

**D) Initialize DRP-AI Translator class**

To run DRP-AI Translator, drp_ai_translator class instance object is required. Please initialize and set the target device.

```
# Initialize DRP-AI Translator class
drp_tran = drp_ai_translator()

# Choose device of run script
drp_tran.set_translator("V2M")
```

**E) Make address map definition file & save**

To make address map definition file, use make_addrfile() function. Please set the start address of the physical memory to map the DRP-AI Object files.

```
# Make address map file
drp_tran.make_addrfile("0x5F000000",addr_file="./addr_map.yaml")
# Check onnx model file
ONNX_MODEL="../../onnx/resnet50v1.onnx“
```

**F) Run DRP-AI Translator**

By call run_translate() function, DRP-AI Translator will execute. The execution result is the same as using "./run_DRP-AI_translator_V2M/L.sh".

```
# Check onnx model file
ONNX_MODEL="../../onnx/resnet50v1.onnx“
drp_tran.run_translate("resnet_test",\
                       onnx=cur_path + "/" + ONNX_MODEL,\
                       prepost=cur_path+"/output.yaml",\
                       addr=cur_path+"/addr_map.yaml"
    )
```

## 2. How to run simulation including DRP pre-post processing

- This section will explain the included sample code. The file name is below:

  <install dir>/UserConfig/sample_scripts/prepost_sim_sample_resnet50.py

- The steps for running a simulation including pre & post processing are as follows.

  A) Define pre & post processing classes

  B) Load input yuy2 file

  C) Run pre processing simulation

D) Run onnx simulation by onnxruntime

E) Run post processing simulation

F) Check the inference result

### A) Define pre & post processing classes

Generate instance objects of pre processing which is used for its simulation. Please refer section 4-2 in User's Manual about parameters of each process.

```
pre1_conv_yuv2rgb = conv_yuv2rgb(DOUT_RGB_FORMAT=0)
pre2_resize_hwc   = resize_hwc(shape_out=[224,224],RESIZE_ALG=1)
pre3_cast         = cast_any_to_fp16()
pre4_normalize    = normalize(cof_add=[-123.675, -116.28, -103.53],\
                              cof_mul= [0.01712475, 0.017507, 0.01742919])
post1_softmax     = softmax(DOUT_FORMAT=1)
```

### B) Load input yuy2 file

Read input data file for simulation.

```
yuy2_file = "./sample_input.bin"
yuy2_bin = np.fromfile(yuy2_file,dtype=np.uint8).reshape((480,640,2))
```

### C) Run pre processing simulation

Set the input data with numpy format for the pre processing instance object. The instance will return the simulation result with numpy format.

```
val1 = pre1_conv_yuv2rgb(yuy2_bin) # Pre1 : Conv_yuy2rgb
val2 = pre2_resize_hwc(val1)       # Pre2 : resize
pilImg = Image.fromarray(val2)     # <for debug> check resized data
pilImg.save('val2.png')
val3 = pre3_cast(val2)             # Pre3 : Cast
val4 = pre4_normalize(val3)        # Pre4 : Normalize
```

### D) Run onnx simulation by onnxruntime

Onnxruntime is used for simulation of onnx part. Since the data format of onnxruntime is CHW, it is necessary to run "transpose" processing.

```
_val4 = val4.transpose(2,0,1)
_val4 = _val4.reshape((1,_val4.shape[0],_val4.shape[1],_val4.shape[2]))
_val4 = _val4.astype(np.float32)
ONNX_MODEL="../../onnx/resnet50v1.onnx"
sess = rt.InferenceSession(ONNX_MODEL)
pred_onnx = sess.run(None, {"data": _val4}) # Run onnx runtime
output = pred_onnx[0] # get onnxruntime output
```

### E) Run post processing simulation

Set the input data with numpy format for the instance object of post processing. The instance will return the simulation result with numpy format.

```
output = output.reshape(1,1,1000)
val5 = post1_softmax(output) # Post1 : Softmax
```

### F) Check the inference result

Finally, check the inference result. This process varies by application. The sample code is for a classification task.

```
print(">> Inference result : ")
get_label(val5[0][0])
```

## 3. API reference

- Details of each API are described below. These APIs are beta versions and subject to change in the future.

### CLASS : python_api.drp_prepost

**drp_prepost. set_input_to_pre(node_name, shape=None, order=None, type=None, format=None)**

Set information about input to preprocessing to drp_prepost class instance object.

**Parameters :**

node_name : str, input node name. e.g. “camera_in”

shape : list, data shape. e.g. [480,640,2]

order : str, data order. e.g. “HWC” / “CHW”

type : str, data type. e.g. “fp16” / “uint8”

format : str, data format. e.g. “RGB” / “YUY2”

**Return :**

None

**drp_prepost. set_input_to_body(node_name, shape=None, order=None, type=None, format=None)**

Set information about input to body to drp_prepost class instance object. “input to body” means input node name of onnx model.

**Parameters :**

node_name : str, input node name. e.g. “input”

shape : list, data shape. e.g. [224,224,3]

order : str, data order. e.g. “HWC”

type : str, data type. e.g. “fp16”

format : str, data format. e.g. “RGB”

**Return :**

None

**drp_prepost. set_output_from_body(node_name, shape=None, order=None, type=None)**

Set information about output from body to drp_prepost class instance object.

“output from body” means output node name of onnx model.

**Parameters :**

node_name : str, input node name. e.g. “output”

shape : list, data shape. e.g. [1000]

order : str, data order. e.g. “HWC” / “C”

type : str, data type. e.g. “fp16”

**Return :**

None

**drp_prepost. set_output_from_post(node_name, shape=None, order=None, type=None, format=None)**

Set information about output from post drp_prepost class instance object. “output from post” means output node of Postprocessing.

**Parameters :**

node_name : str, input node name. e.g. “post_out”

shape : list, data shape. e.g. [1000]

order : str, data order. e.g. “C”

type : str, data type. e.g. “fp32” / “fp16”

**Return :**

None

**drp_prepost. set_preprocess_sequence(src=[], dest=[], pp_seq=[])**

Set preprocess sequence to drp_prepost class instance object.

**Parameters :**

src : list, source node name of preprocess sequence. e.g. [“camera_in”]

dest : list, destination node name of preprocess sequence. shape. e.g. [“input”]

pp_seq : list, preprocess instance list. e.g. [conv_yuv2rgb, resize_hwc, cast, normalize]

**Return :**

None

**drp_prepost. set_postprocess_sequence(src=[], dest=[], pp_seq=[])**

Set postprocess sequence to drp_prepost class instance object.

**Parameters :**

src : list, source node name of postprocess sequence. e.g. [“output”]

dest : list, destination node name of postprocess sequence. shape. e.g. [“post_out”]

pp_seq : list, preprocess instance list. e.g. [softmax]

**Return :**

None

**drp_prepost. show_param()**

Show prepopst processing definition status to console.

**Parameters :**

None

**Return :**

None

**drp_prepost. save(file_name)**

Save prepost processing definition information as yaml file .

**Parameters :**

file_name : str, output file name. e.g. “output.yaml”

**Return :**

None

## CLASS : python_api.drp_ai_translator

**drp_ai_translator.set_translator(device)**

Select target device.

**Parameters :**

device : str, target device. e.g. “V2M” / “V2L”

**Return :**

None

**drp_ai_translator.make_addrfile(start_addr, addr_file=None)**

Save address map definition file

**Parameters :**

start_addr: str, start address of the physical memory to map the DRP-AI Object files. e.g. “0x5F00000”

addr_file : str, output yaml file name. e.g. “./addr_map.yaml”

**Return :**

None

**drp_ai_translator.run_translate(prefix, onnx=None, prepost=None, addr=None)**

Run DRP-AI Translator

**Parameters :**

prefix : str, prefix is output folder name. e.g. “Resnet50_test”

onnx : str, input onnx file path. e.g. “../onnx/resnet50.onnx”

prepost : str, prepost processing definition file path. e.g. “./prepost.yaml”

addr : str, address map definition file path. e.g. “./addrmap.yaml”

**Return :**

None

## CLASS : python_api. <Pre and Postprocessing>

**drp_ai_translator.<Pre and Postprocessing>(**Parameters)**

Each Pre & Postprocessing has python class which is used as input data for drp_prepost class.

And those class have a function to run simulation.

**Parameters :**

Please refer section 5-3 in User’s Manual.

**Return :**

Pre/Postprocessing instance object or simulated output

After initialization, the instance object can be obtained as a return value.

When input data is set to the instance, it runs the simulation, and returns the execution results.

**Supported Pre/Postprocessing :**

transpose, conv_yuv2rgb, conv_x2gray, resize_hwc, cast_any_to_fp16, normalize, memcopy, crop, softmax, cast_fp16_fp32, argminmax

**Examples :**

```
>> # Generate preprocessing instance objects
>> pre1_cast          = cast_any_to_fp16()
>> pre2_normalize     = normalize(cof_add=[-123.675, -116.28, -103.53], cof_mul= [0.01712475, 0.017507, 0.01742919])
>> # Run simulation. The input data must be numpy array.
>> pre1_out           = pre1_cast(input)
>> pre2_out           = pre2_normalize(pre1_out)
```