

A child wearing a pilot's cap and goggles sits on the shoulder of a large, white, humanoid robot. The child is pointing their finger towards a large, glowing globe in the background. The globe features a world map overlay. The scene is set against a blue sky with streaks of light, suggesting a futuristic or space-themed environment.

# 昇腾CANN系列教程

——**TBE-DSL**算子验证及调试

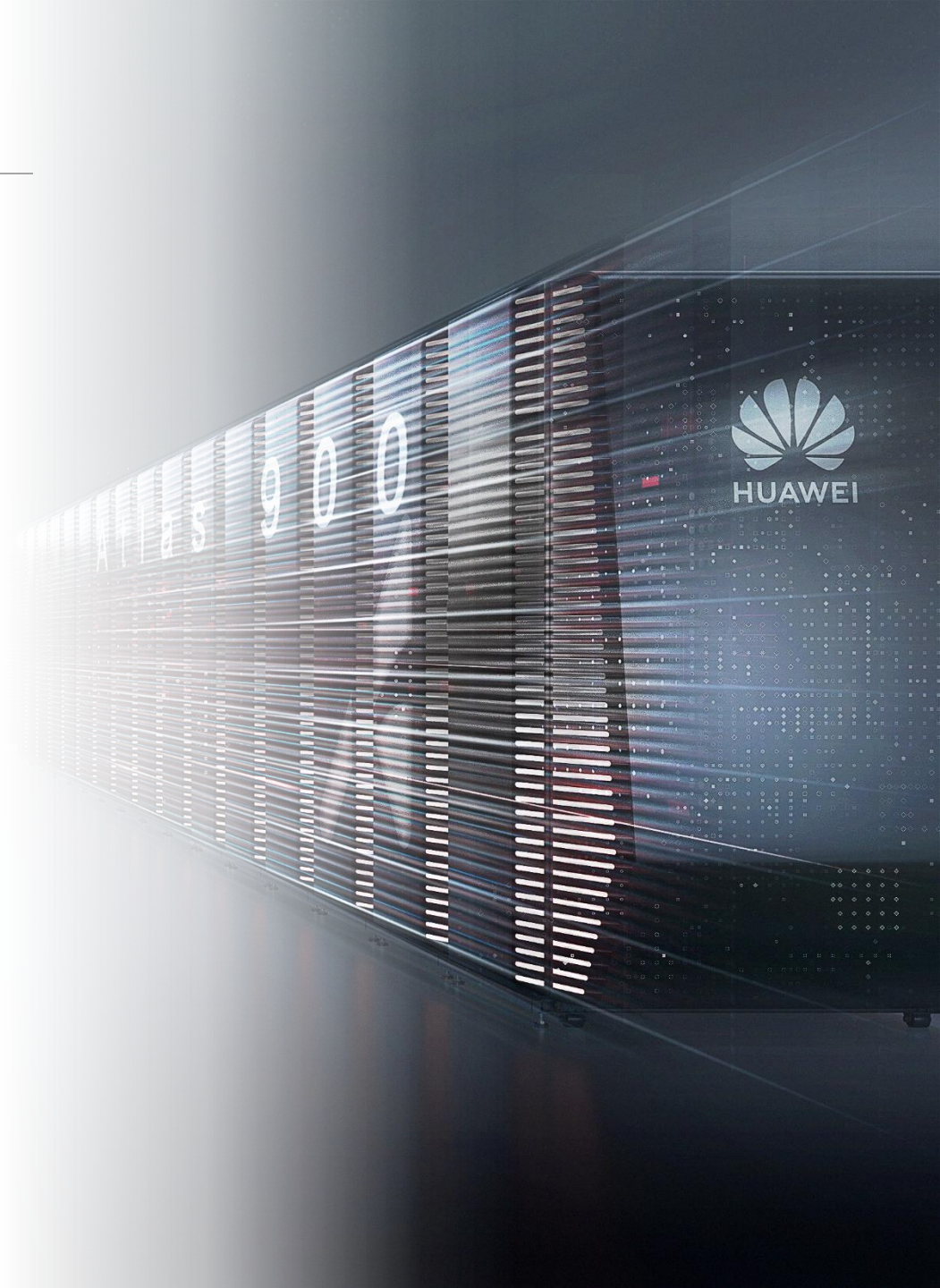


# 关于本课程

- 本课程是基于：
  - MindStudio+CANN开发环境
  - 掌握TBE算子的开发
- 学完本课程后，您应该能：
  - 掌握TBE-DSL算子的UT测试流程
  - 掌握测试结果的分析方式

# 1 DSL算子UT测试方法

## 2 UT测试实战演示



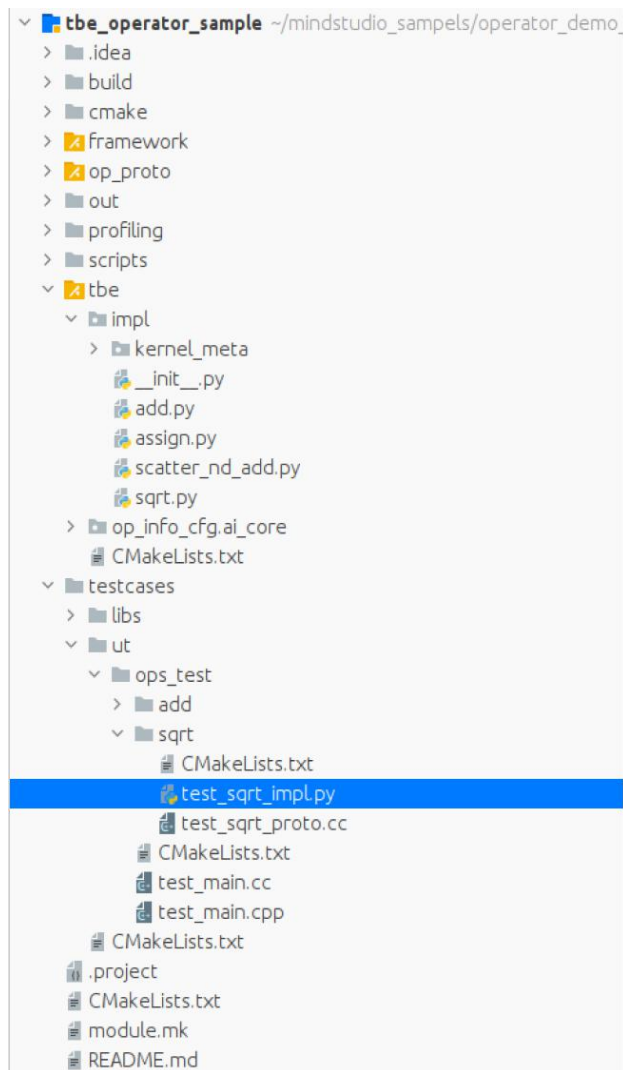
# UT测试简介

基于**MindStudio**进行算子开发的场景下，用户可基于**MindStudio**进行算子的**UT**测试，**UT**

(**Unit Test**：单元测试) 是开发人员进行算子代码验证的手段之一，主要目的是：

- 测试算子代码的正确性，验证输入输出结果与设计的一致性。
- **UT**侧重于保证算子程序能够跑通，选取的场景组合应能覆盖算子代码的所有分支（一般来说覆盖率要达到**100%**），从而降低不同场景下算子代码的编译失败率。
- （测试类的详细定义可参见***Ascend-cann-toolkit*安装目录/ascend-toolkit/{version}/{arch}-linux/toolkit/python/site-packages/op\_test\_frame/ut/op\_ut.py**文件。）

# UT测试工程介绍

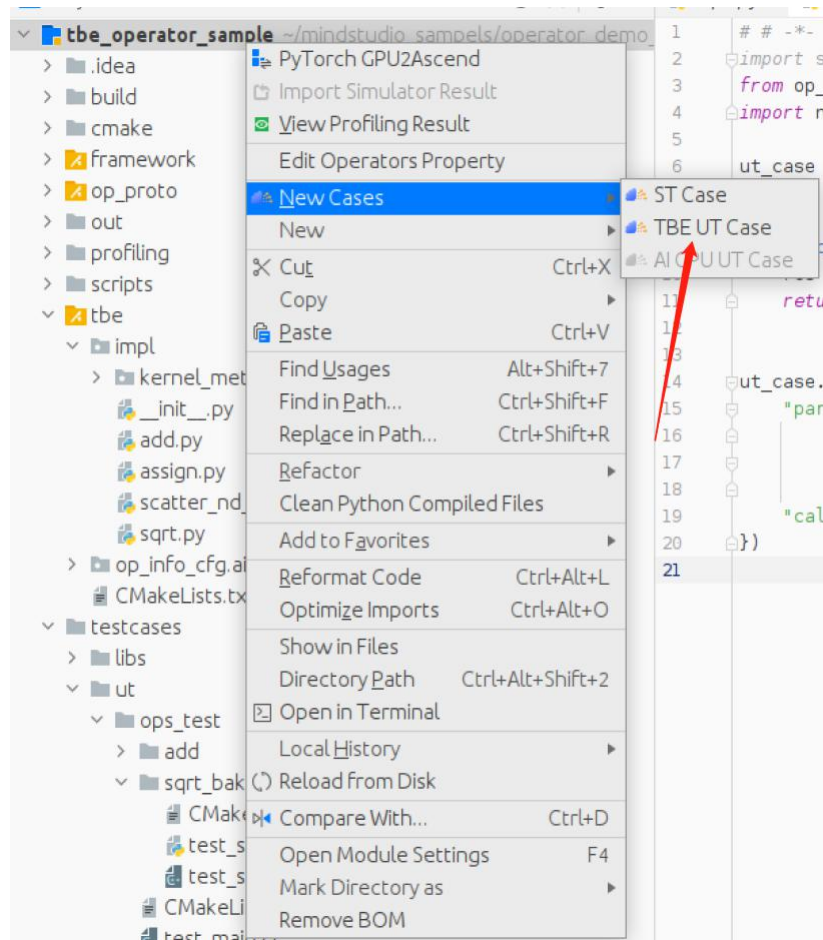




# UT测试的流程

## ——以Sqrt算子为例

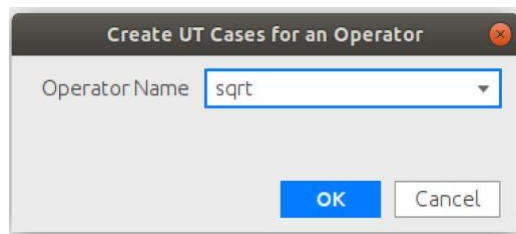
- 在MindStudio的工程总目录上单击右键，New Cases, TBE UT Case:



# UT测试的流程

## ——以Sqrt算子为例

- 选择算子:



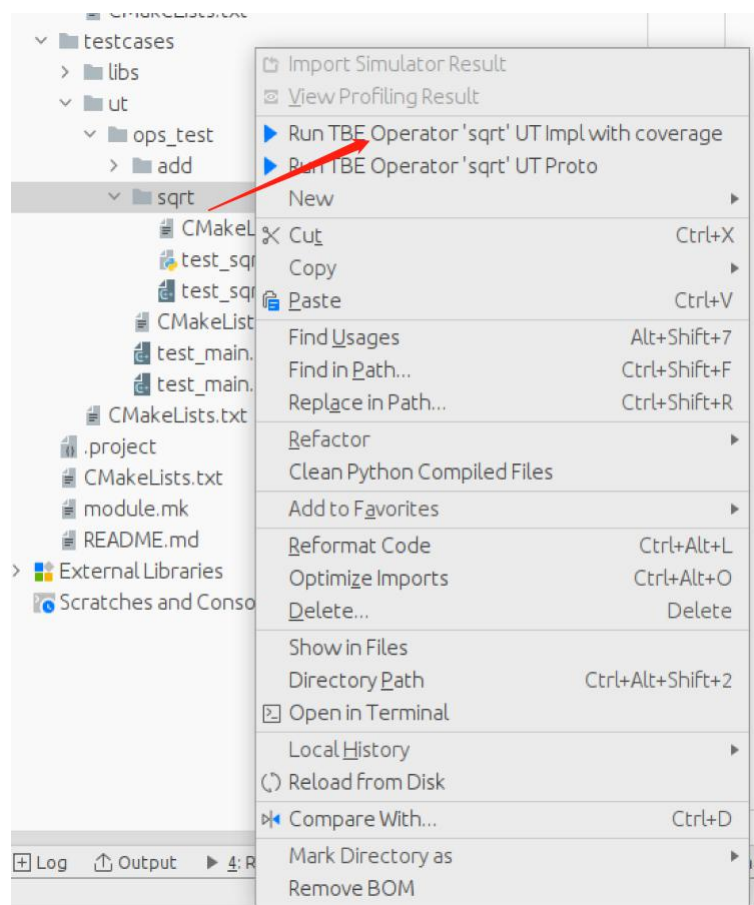
- 实现test\_算子名称\_impl.py文件:

```
1  # -*- coding:utf-8 -*-
2  import ...
3
4
5  ut_case = BroadcastOpUT("sqrt")
6
7  # [TODO] coding expect function here
8  # def calc_expect_func(input_x, input_y, output_z):
9  #     res = input_x["value"] + input_y["value"]
10 #     return [res, ]
11
12
13 # [TODO] coding cases here
14 # ut_case.add_precision_case("all", {
15 #     "params": [{"dtype": "float16", "format": "ND", "ori_format": "ND", "ori_shape": (32,), "shape": (32,),
16 #                 "param_type": "input"},
17 #                 {"dtype": "float16", "format": "ND", "ori_format": "ND", "ori_shape": (32,), "shape": (32,),
18 #                 "param_type": "input"},
19 #                 {"dtype": "float16", "format": "ND", "ori_format": "ND", "ori_shape": (32,), "shape": (32,),
20 #                 "param_type": "output"}],
21 #     "calc_expect_func": calc_expect_func
22 # })
23
```

# UT测试的流程

## ——以Sqrt算子为例

- 测试用例编写完毕后，在ut->sqrt目录上单击右键，Run TBE Operator ‘算子名称’ UT impl with Coverage:

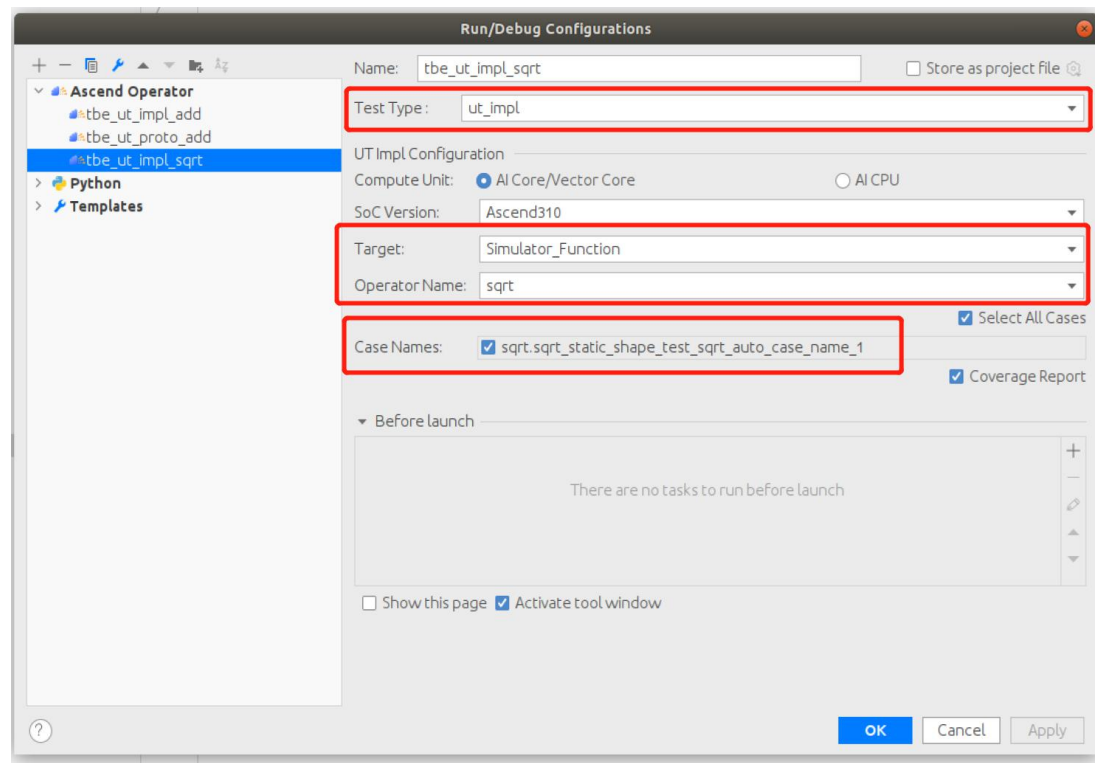




# UT测试的流程

## ——以Sqrt算子为例

- 首次启动UT测试，要配置运行选项：



- 配置完毕后，单击OK，再启动一次UT测试即可。

# UT测试的结果分析

```
tbe_ut_impl_sqrt x
[INFO] 2021-06-16 22:02:44.729429 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 190] Load ascend simulator success.
[INFO] 2021-06-16 22:02:45.892051 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtSetDevice() success.
[INFO] 2021-06-16 22:02:45.897981 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtStreamCreate() success.
[INFO] 2021-06-16 22:02:45.905426 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtMalloc() success.
[INFO] 2021-06-16 22:02:45.911060 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtMemcpy() success.
[INFO] 2021-06-16 22:02:45.916153 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtMalloc() success.
[INFO] 2021-06-16 22:02:45.919284 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtMemset() success.
[INFO] 2021-06-16 22:02:45.922726 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtDevBinaryRegister() success.
[INFO] 2021-06-16 22:02:45.927744 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtFunctionRegister() success.
[INFO] 2021-06-16 22:02:46.109689 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtKernelLaunch() success.
[INFO] 2021-06-16 22:02:46.141216 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtStreamSynchronize() success.
[INFO] 2021-06-16 22:02:46.146577 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtMallocHost() success.
[INFO] 2021-06-16 22:02:46.148240 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtMemcpy() success.
[INFO] 2021-06-16 22:02:46.152537 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtFree() success.
[INFO] 2021-06-16 22:02:46.157522 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtFree() success.
[INFO] 2021-06-16 22:02:46.162470 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtStreamDestroy() success.
[INFO] 2021-06-16 22:02:46.184280 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/runtime/rt_api.py", line 706] Runtime API call rtDeviceReset() success.
0 0 0.032
ok

-----
run 1 tests, success: 1
>>> end run test case, op_type:sqrt cost time: 4
[INFO] 2021-06-16 22:02:46.292293 [File "/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/op_test_frame/ut/op_ut_runner.py", line 182] end run: /home/ascend/mindstudio_samples/operator_demo
/home/ascend/mindstudio_samples/operator_demo_projects/tbe_operator_sample/out/bin/report/combine_rpt_path ['rpt_1_test_sqrt_impl.data']
load /home/ascend/mindstudio_samples/operator_demo_projects/tbe_operator_sample/out/bin/report/combine_rpt_path/rpt_1_test_sqrt_impl.data success, case cnt: 1

run command: None

-----
- test soc: [Ascend310]
- test case count: 1
- success count: 1
- failed count: 0
- error count: 0

-----
Soc Version: Ascend310
success: [sqrt] sqrt_static_shape_test_sqrt_auto_case_name_1 (Ascend310) (precision)

-----

end run ops ut time: 2021-06-16 22:02:46.573489
TestRun Finished
Run command is:
/home/ascend/Ascend/ascend-toolkit/5.0.2.alpha001/toolkit/python/site-packages/bin/op_ut_run --case_files=/home/ascend/mindstudio_samples/operator_demo_projects/tbe_operator_sample/testcases/ut/ops_test/sqrt/test_sqrt_i
report index.html: http://localhost:63342/tbe\_operator\_sample/out/coverage\_report/ut\_impl/index.html?ijt=tlsszboxmnbzryfjwakmu
```

# UT测试的结果分析

Coverage report: 3%

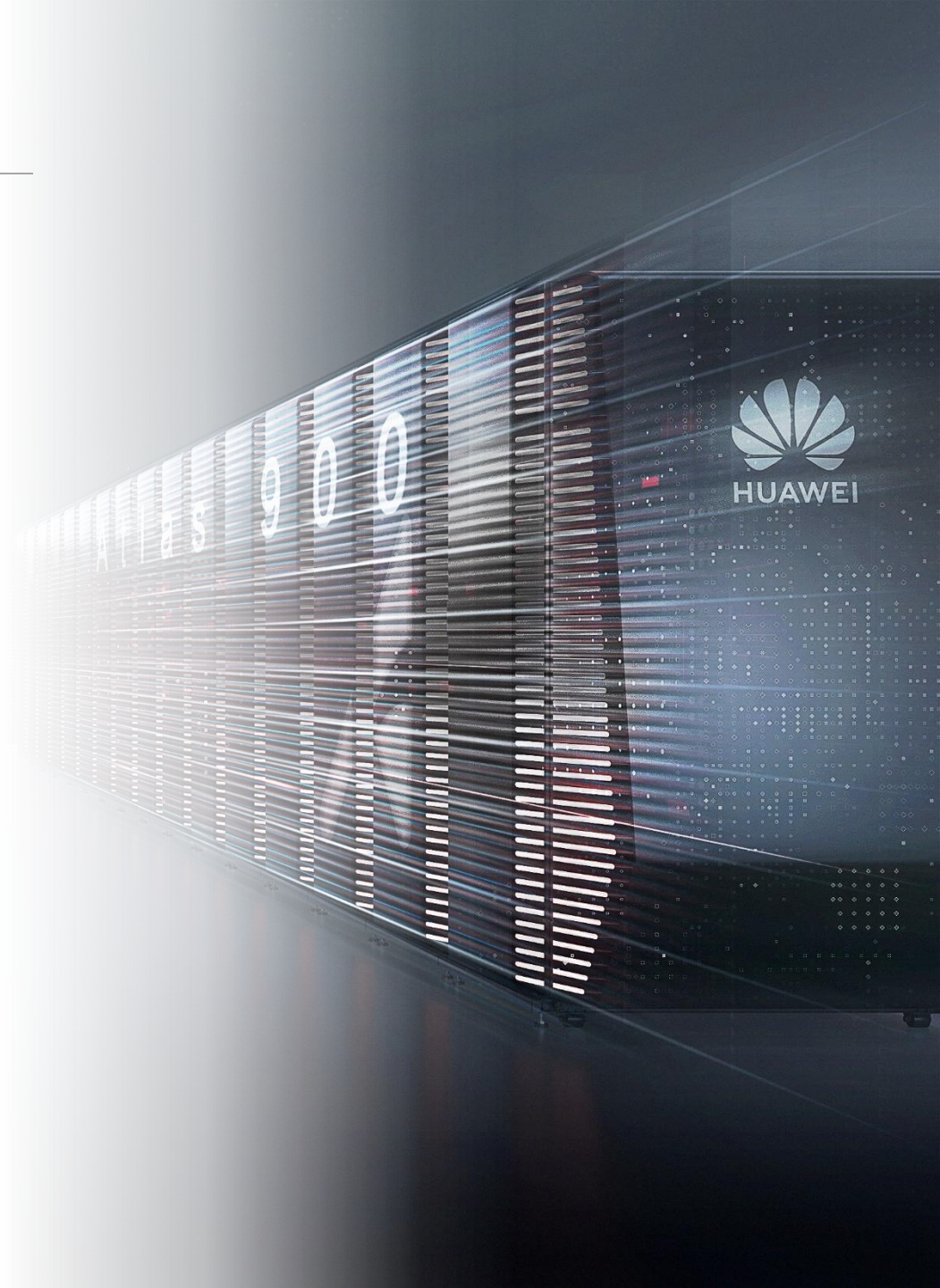
Module ↗	statements	missing	excluded	coverage
/home/ascend/mindstudio_sampels/operator_demo_projects/tbe_operator_sample/tbe/impl/__init__.py	0	0	0	100%
/home/ascend/mindstudio_sampels/operator_demo_projects/tbe_operator_sample/tbe/impl/add.py	40	40	0	0%
/home/ascend/mindstudio_sampels/operator_demo_projects/tbe_operator_sample/tbe/impl/assign.py	151	151	0	0%
/home/ascend/mindstudio_sampels/operator_demo_projects/tbe_operator_sample/tbe/impl/scatter_nd_add.py	320	320	0	0%
/home/ascend/mindstudio_sampels/operator_demo_projects/tbe_operator_sample/tbe/impl/sqrt.py	21	3	0	86%
<b>Total</b>	<b>532</b>	<b>514</b>	<b>0</b>	<b>3%</b>

coverage.py v5.5, created at 2021-06-16 22:02 +0800



# 1 DSL算子UT测试方法

## 2 UT测试实战演示



# Thank you.

昇腾开发者社区



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每个组织，构建万物互联的智能世界。

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organization for a fully connected,  
intelligent world.**

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