

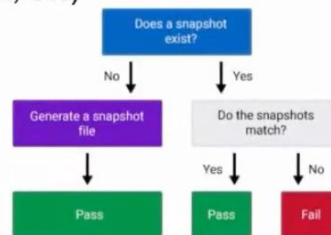
Snapshot Testing and CDK

What we will cover in this talk

- What is Snapshot Testing
- How we can use it to test CDK code
- Custom serializers and how to use them

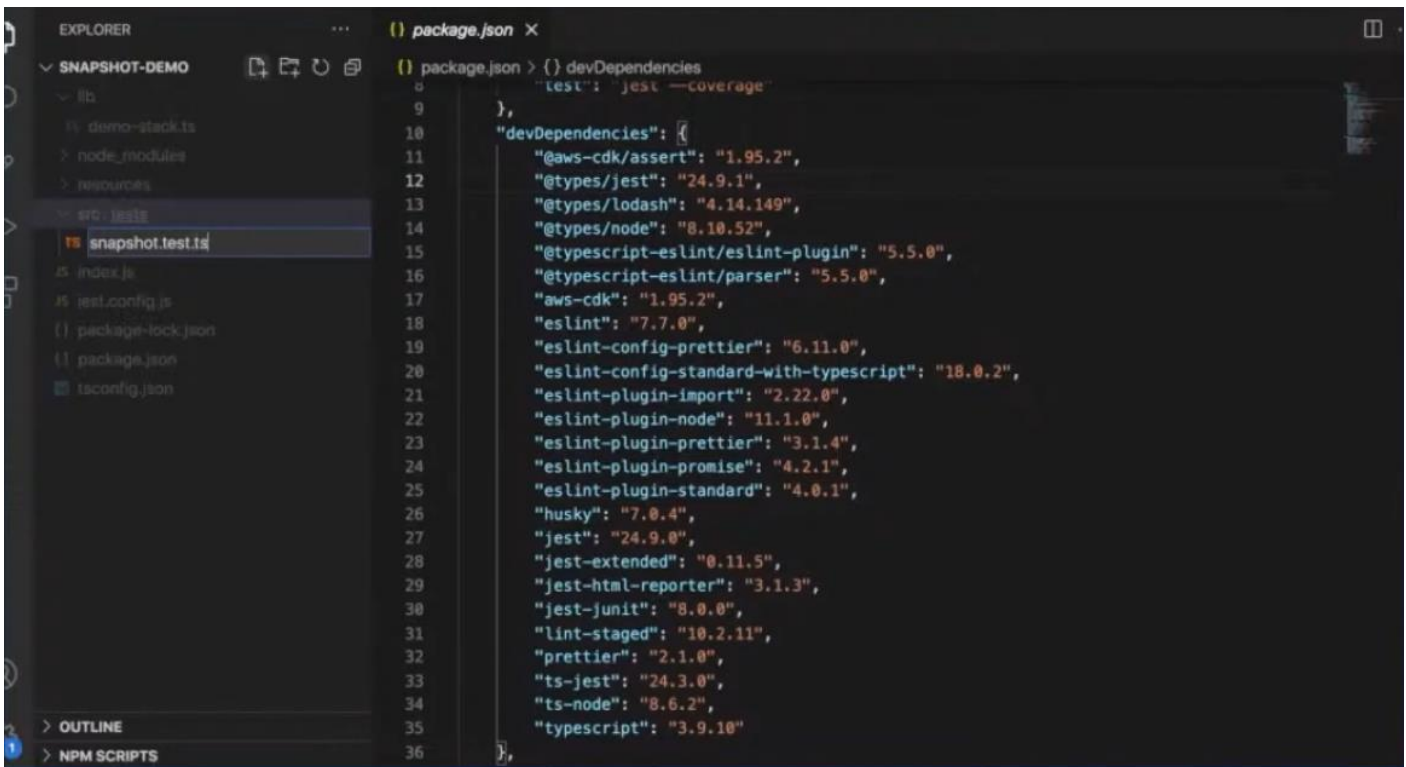
What is Snapshot Testing?

- Multiple use cases
- Uses output comparison
- Language support (Java, JavaScript, TypeScript, etc)
- Testing framework support (Jest, Pytest, Junit, etc)



The screenshot shows a Visual Studio Code editor with a project named 'SNAPSHOT-DEMO'. The Explorer sidebar on the left shows the file structure: 'lib', 'node_modules', 'resources', 'src', 'tests', and 'package-lock.json'. The 'package.json' file is open in the main editor, showing the following content:

```
1 {
2   "name": "demo",
3   "version": "0.1.0",
4   "scripts": {
5     "build": "tsc",
6     "watch": "tsc -w",
7     "cdk": "cdk",
8     "test": "jest --coverage"
9   },
10  "devDependencies": {
11    "@aws-cdk/assert": "1.95.2",
12    "@types/jest": "24.9.1",
13    "@types/lodash": "4.14.149",
14    "@types/node": "8.10.52",
15    "@typescript-eslint/eslint-plugin": "5.5.0",
16    "@typescript-eslint/parser": "5.5.0",
17    "aws-cdk": "1.95.2",
18    "eslint": "7.7.0",
19    "eslint-config-prettier": "6.11.0",
20    "eslint-config-standard-with-typescript": "18.0.2",
21    "eslint-plugin-import": "2.22.0",
22    "eslint-plugin-node": "11.1.0",
23    "eslint-plugin-prettier": "3.1.4",
24    "eslint-plugin-promise": "4.2.1",
25    "eslint-plugin-standard": "4.0.1",
26    "husky": "7.0.4",
27    "jest": "24.9.0",
28    "jest-extended": "0.11.5",
```

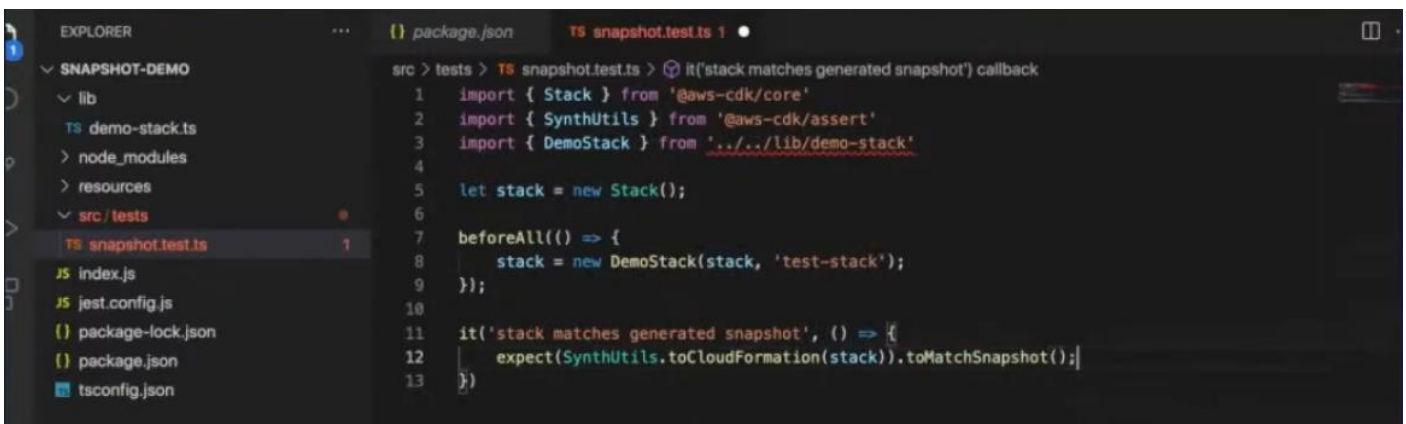


EXPLORER

- SNAPSHOT-DEMO
 - lib
 - demo-stack.ts
 - node_modules
 - resources
 - src / tests
 - snapshot.test.ts
 - index.js
 - jest.config.js
 - package-lock.json
 - package.json
 - tsconfig.json

package.json

```
{
  "devDependencies": {
    "test": "jest --coverage"
  },
  "devDependencies": {
    "@aws-cdk/assert": "1.95.2",
    "@types/jest": "24.9.1",
    "@types/lodash": "4.14.149",
    "@types/node": "8.10.52",
    "@typescript-eslint/eslint-plugin": "5.5.0",
    "@typescript-eslint/parser": "5.5.0",
    "aws-cdk": "1.95.2",
    "eslint": "7.7.0",
    "eslint-config-prettier": "6.11.0",
    "eslint-config-standard-with-typescript": "18.0.2",
    "eslint-plugin-import": "2.22.0",
    "eslint-plugin-node": "11.1.0",
    "eslint-plugin-prettier": "3.1.4",
    "eslint-plugin-promise": "4.2.1",
    "eslint-plugin-standard": "4.0.1",
    "husky": "7.0.4",
    "jest": "24.9.0",
    "jest-extended": "0.11.5",
    "jest-html-reporter": "3.1.3",
    "jest-junit": "8.0.0",
    "lint-staged": "10.2.11",
    "prettier": "2.1.0",
    "ts-jest": "24.3.0",
    "ts-node": "8.6.2",
    "typescript": "3.9.10"
  }
},
```

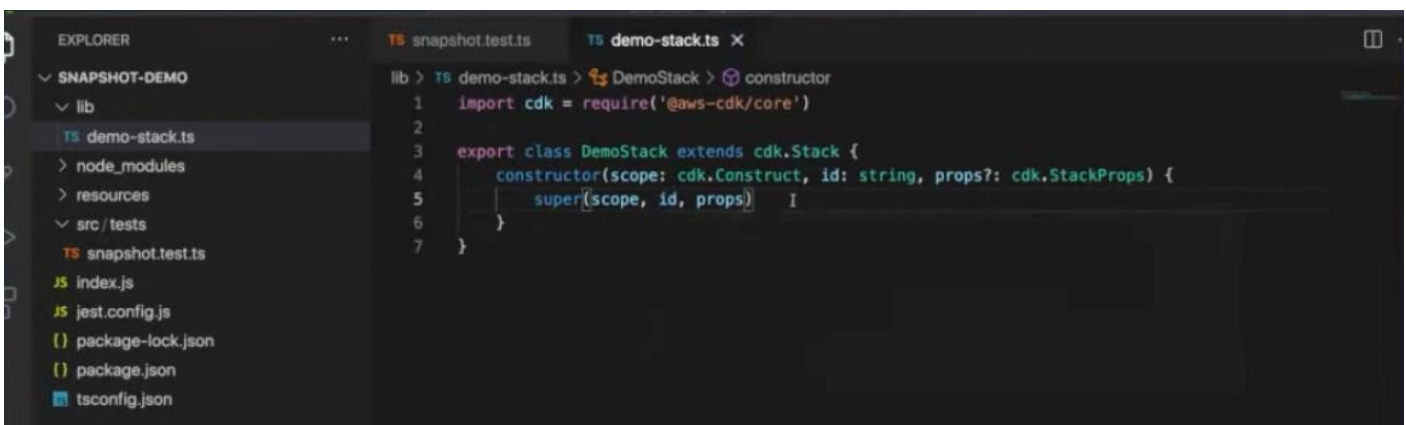


EXPLORER

- SNAPSHOT-DEMO
 - lib
 - demo-stack.ts
 - node_modules
 - resources
 - src / tests
 - snapshot.test.ts
 - index.js
 - jest.config.js
 - package-lock.json
 - package.json
 - tsconfig.json

src > tests > TS snapshot.test.ts

```
1 import { Stack } from '@aws-cdk/core'
2 import { SynthUtils } from '@aws-cdk/assert'
3 import { DemoStack } from '../lib/demo-stack'
4
5 let stack = new Stack();
6
7 beforeAll(() => {
8   stack = new DemoStack(stack, 'test-stack');
9 });
10
11 it('stack matches generated snapshot', () => {
12   expect(SynthUtils.toCloudFormation(stack)).toMatchSnapshot();
13 })
```



EXPLORER

- SNAPSHOT-DEMO
 - lib
 - demo-stack.ts
 - node_modules
 - resources
 - src / tests
 - snapshot.test.ts
 - index.js
 - jest.config.js
 - package-lock.json
 - package.json
 - tsconfig.json

lib > TS demo-stack.ts

```
1 import cdk = require('@aws-cdk/core')
2
3 export class DemoStack extends cdk.Stack {
4   constructor(scope: cdk.Construct, id: string, props?: cdk.StackProps) {
5     super(scope, id, props);
6   }
7 }
```

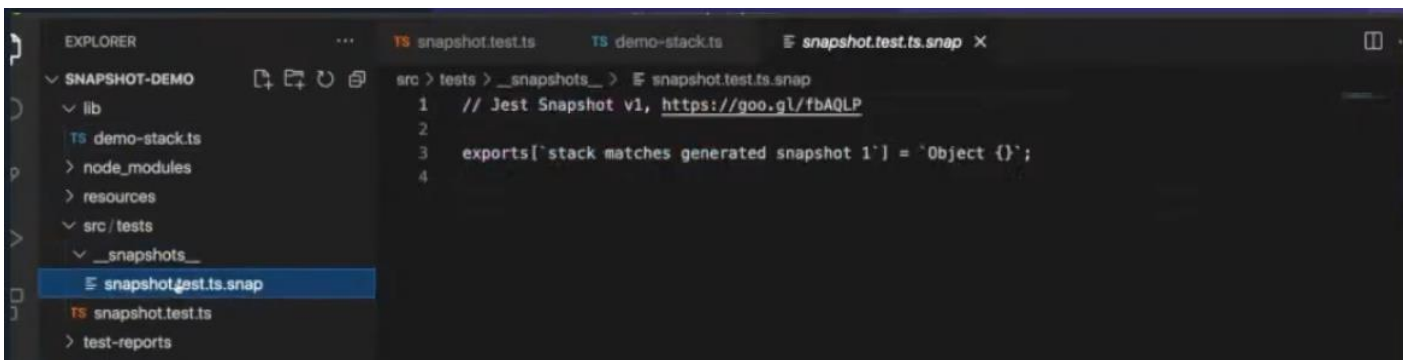
We are now ready to run our new tests.

```
Last login: Mon May 16 19:33:01 on ttys000
~/ cd Desktop/dev/snapshot-demo
~/Desktop/dev/snapshot-demo/ jest
RUNS src/tests/snapshot.test.ts
```

```
Last login: Mon May 16 19:33:01 on ttys000
~/ cd Desktop/dev/snapshot-demo
~/Desktop/dev/snapshot-demo/ jest
PASS src/tests/snapshot.test.ts
  ✓ stack matches generated snapshot (21ms)

> 1 snapshot written.
Snapshot Summary
  > 1 snapshot written from 1 test suite.

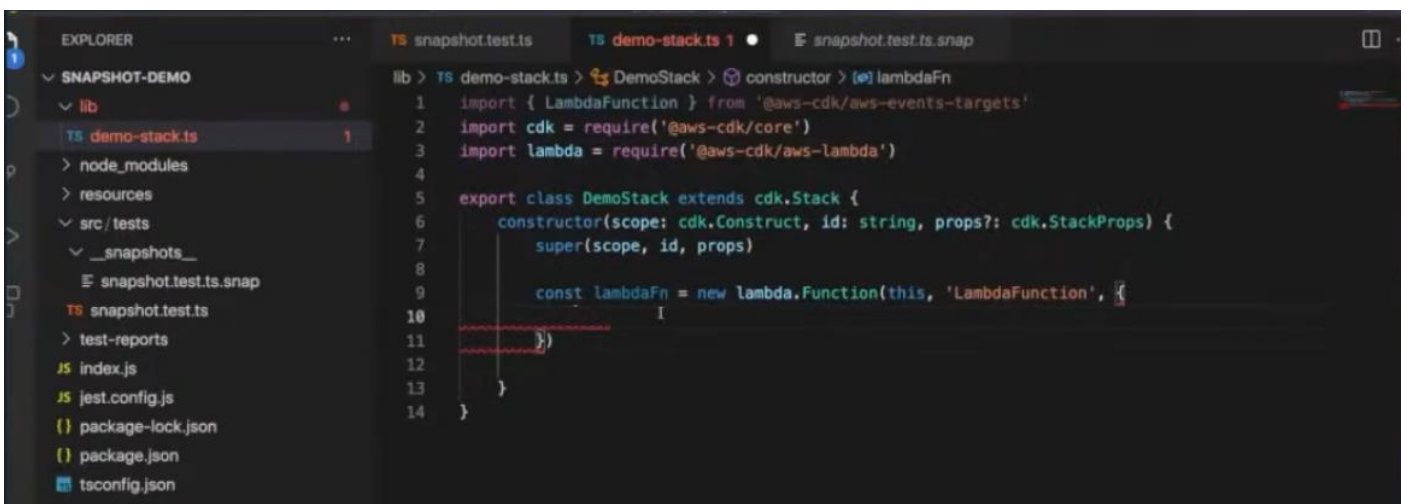
Test Suites: 1 passed, 1 total
Tests: 1 passed, 1 total
Snapshots: 1 written, 1 total
Time: 2.5s
Ran all test suites.
~/Desktop/dev/snapshot-demo/
```



The image shows the VS Code interface. The Explorer on the left shows the project structure with 'src/tests/__snapshots__' expanded, highlighting 'snapshot.test.ts.snap'. The Editor on the right shows the content of this snapshot file:

```
src > tests > __snapshots__ > snapshot.test.ts.snap
1 // Jest Snapshot v1, https://goo.gl/fbAQLP
2
3 exports['stack matches generated snapshot 1'] = `Object {}`;
4
```

The synthesized code generates the first CF template file and compares with an empty object file to pass for the first time. Next, let us add some resources to our stack as below and then see that the snapshot comparison will fail.



The image shows the VS Code interface. The Explorer on the left shows the project structure with 'lib' expanded, highlighting 'demo-stack.ts'. The Editor on the right shows the content of this file:

```
lib > TS demo-stack.ts > DemoStack > constructor > lambdaFn
1 import { LambdaFunction } from '@aws-cdk/aws-events-targets'
2 import cdk = require('@aws-cdk/core')
3 import lambda = require('@aws-cdk/aws-lambda')
4
5 export class DemoStack extends cdk.Stack {
6   constructor(scope: cdk.Construct, id: string, props?: cdk.StackProps) {
7     super(scope, id, props)
8
9     const lambdaFn = new lambda.Function(this, 'LambdaFunction', {
10       // ...
11     })
12   }
13 }
14
```

We will create a basic Lambda function resource

```
EXPLORER    ...    TS snapshot.test.ts    TS demo-stack.ts    snapshot.test.ts.snap

SNAPSHOT-DEMO
├── lib
│   ├── demo-stack.ts
│   ├── node_modules
│   └── resources/lambda
│       ├── index.js
│       └── src/tests
│           ├── __snapshots__
│           │   └── snapshot.test.ts.snap
│           ├── snapshot.test.ts
│           ├── test-reports
│           ├── jest.config.js
│           ├── package-lock.json
│           ├── package.json
│           └── tsconfig.json
└── lib > TS demo-stack.ts > DemoStack > constructor > lambdaFn
    1  import { LambdaFunction } from '@aws-cdk/aws-events-targets'
    2  import cdk = require('@aws-cdk/core')
    3  import lambda = require('@aws-cdk/aws-lambda')
    4  import { IndexOf } from 'lodash'
    5
    6  export class DemoStack extends cdk.Stack {
    7      constructor(scope: cdk.Construct, id: string, props?: cdk.StackProps) {
    8          super(scope, id, props)
    9
    10         const lambdaFn = new lambda.Function(this, 'LambdaFunction', {
    11             runtime: lambda.Runtime.NODEJS_14_X,
    12             code: lambda.Code.fromAsset('resources/lambda'),
    13             handler: 'index.handler'
    14         })
    15     }
    16 }
    17 }
```

```
1st login: Mon May 16 19:50:58 on ttys000
~/ cd Desktop/dev/snapshot-demo
~/Desktop/dev/snapshot-demo/ jest
PASS src/tests/snapshot.test.ts
  ✓ stack matches generated snapshot (15ms)

Test Suites: 1 passed, 1 total
Tests:       1 passed, 1 total
Snapshots:   1 passed, 1 total
Time:        0.91s, estimated 1s
Run all test suites.
~/Desktop/dev/snapshot-demo/ jest
RUNS src/tests/snapshot.test.ts
```

```
src/tests/snapshot.test.ts
  ✓ stack matches generated snapshot (45ms)

  ● stack matches generated snapshot

    expect(received).toMatchSnapshot()

    Snapshot name: "stack matches generated snapshot 1"

    - Snapshot
    + Received

    - Object {}
    + Object {
      + "Parameters": Object {
      +   "AssetParametersc5c19446d182dc2f833ac7871c13a235ec29288b063c0b14461116279b0d065390c0e659e47c3": Object {
      +     "Description": "Artifact hash for assets "c5c19446d182dc2f833ac7871c13a235ec29288b063c0b14461116279b0d065390c0e659e47c3",
      +     "Type": "String",
      +   },
      +   "AssetParametersc5c19446d182dc2f833ac7871c13a235ec29288b063c0b14461116279b0d065390c0e659e47c3": Object {
      +     "Description": "S3 bucket for assets "c5c19446d182dc2f833ac7871c13a235ec29288b063c0b14461116279b0d065390c0e659e47c3",
      +     "Type": "String",
      +   },
      +   "AssetParametersc5c19446d182dc2f833ac7871c13a235ec29288b063c0b14461116279b0d065390c0e659e47c3": Object {
      +     "Description": "S3 key for asset version "c5c19446d182dc2f833ac7871c13a235ec29288b063c0b14461116279b0d065390c0e659e47c3",
      +     "Type": "String",
      +   },
      + },
      + "Resources": Object {
      +   "LambdaFunction8f211417": Object {
      +     "DependsOn": Array [
      +       "LambdaFunctionServiceRoleC555A460",
      +     ],
      +     "Properties": Object {
      +       "Code": Object {
      +         "S3Bucket": Object {
      +           "Ref": "AssetParametersc5c19446d182dc2f833ac7871c13a235ec29288b063c0b14461116279b0d065390c0e659e47c3",
      +         },
      +         "S3Key": Object {
      +           "Fn::Join": Array [

```

```
*      "ManagedPolicyArn": Array [
*        Object {
*          "Fn::Join": Array [
*            "=",
*            Array [
*              "arn:",
*              Object {
*                "Ref": "AWS::Partition",
*              },
*              "iam::aws:policy/service-role/AWSLambdaBasicExecutionRole",
*            ],
*          },
*        ],
*      ],
*      "Type": "AWS::IAM::Role",
*    },
*  ],
* }
10 |
11 | it('stack matches generated snapshot', () => {
> 12 |   expect(SynthUtils.toCloudFormation(stack)).toMatchSnapshot();
    |                                     ^
13 | });

at Object.<anonymous> (src/tests/snapshot.test.ts:12:48)

> 1 snapshot failed.
Snapshot Summary
> 1 snapshot failed from 1 test suite. Inspect your code changes or re-run jest with "-u" to update them.

Test Suites: 1 failed, 1 total
Tests:       1 failed, 1 total
Snapshots:   1 failed, 1 total
Time:        1.593s
Run all test suites.
~/Desktop/dev/snapshot-demo/ jest -u
RUNS  src/tests/snapshot.test.ts
```

The test fails and shows us something as changed, we can now run a simple command to update our snapshot if we approve the code change.

```
*      "ManagedPolicyArn": Array [
*        Object {
*          "Fn::Join": Array [
*            "=",
*            Array [
*              "arn:",
*              Object {
*                "Ref": "AWS::Partition",
*              },
*              "iam::aws:policy/service-role/AWSLambdaBasicExecutionRole",
*            ],
*          },
*        ],
*      ],
*      "Type": "AWS::IAM::Role",
*    },
*  ],
* }
10 |
11 | it('stack matches generated snapshot', () => {
> 12 |   expect(SynthUtils.toCloudFormation(stack)).toMatchSnapshot();
    |                                     ^
13 | });

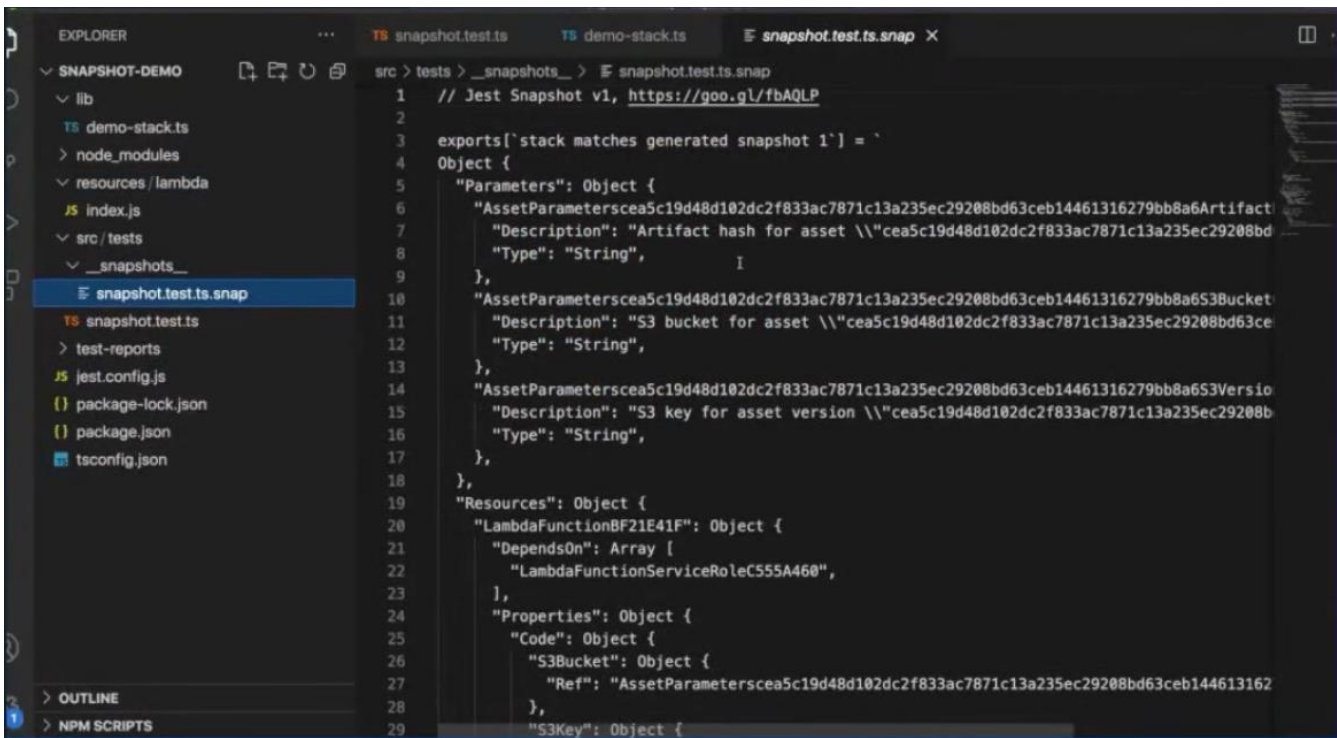
at Object.<anonymous> (src/tests/snapshot.test.ts:12:48)

> 1 snapshot failed.
Snapshot Summary
> 1 snapshot failed from 1 test suite. Inspect your code changes or re-run jest with "-u" to update them.

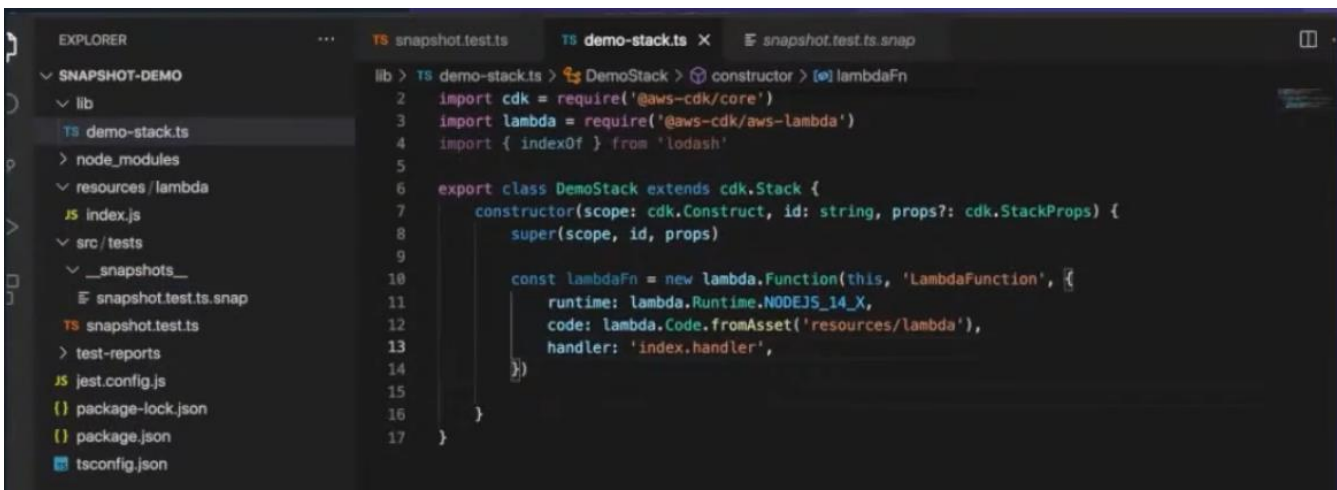
Test Suites: 1 failed, 1 total
Tests:       1 failed, 1 total
Snapshots:   1 failed, 1 total
Time:        1.593s
Run all test suites.
~/Desktop/dev/snapshot-demo/ jest -u
PASS  src/tests/snapshot.test.ts
  ✓ stack matches generated snapshot (39ms)

> 1 snapshot updated.
Snapshot Summary
> 1 snapshot updated from 1 test suite.

Test Suites: 1 passed, 1 total
Tests:       1 passed, 1 total
Snapshots:   1 updated, 1 total
Time:        1.55s, estimated 2s
Run all test suites.
~/Desktop/dev/snapshot-demo/
```

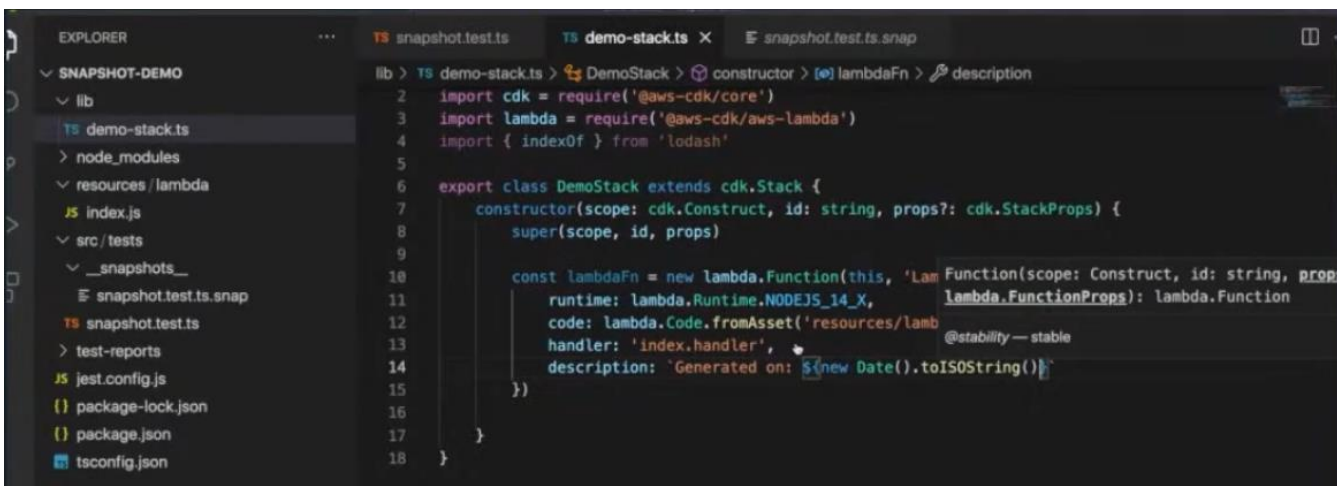



```
src > tests > __snapshots__ > snapshot.test.ts.snap
1 // Jest Snapshot v1, https://goo.gl/fbAQLP
2
3 exports['stack matches generated snapshot 1'] = `
4   Object {
5     "Parameters": Object {
6       "AssetParameterscea5c19d48d102dc2f833ac7871c13a235ec29208bd63ceb14461316279bb8a6Artifact": {
7         "Description": "Artifact hash for asset \\\"cea5c19d48d102dc2f833ac7871c13a235ec29208bd63ceb14461316279bb8a6Artifact\\\"",
8         "Type": "String",
9       },
10      "AssetParameterscea5c19d48d102dc2f833ac7871c13a235ec29208bd63ceb14461316279bb8a6S3Bucket": {
11        "Description": "S3 bucket for asset \\\"cea5c19d48d102dc2f833ac7871c13a235ec29208bd63ceb14461316279bb8a6S3Bucket\\\"",
12        "Type": "String",
13      },
14      "AssetParameterscea5c19d48d102dc2f833ac7871c13a235ec29208bd63ceb14461316279bb8a6S3Version": {
15        "Description": "S3 key for asset version \\\"cea5c19d48d102dc2f833ac7871c13a235ec29208bd63ceb14461316279bb8a6S3Version\\\"",
16        "Type": "String",
17      },
18    },
19    "Resources": Object {
20      "LambdaFunctionBF21E41F": Object {
21        "DependsOn": Array [
22          "LambdaFunctionServiceRoleC555A460",
23        ],
24        "Properties": Object {
25          "Code": Object {
26            "S3Bucket": Object {
27              "Ref": "AssetParameterscea5c19d48d102dc2f833ac7871c13a235ec29208bd63ceb14461316279bb8a6S3Bucket",
28            },
29            "S3Key": Object {
```



```
lib > TS demo-stack.ts > DemoStack > constructor > lambdaFn
2 import cdk = require('@aws-cdk/core')
3 import lambda = require('@aws-cdk/aws-lambda')
4 import { index0f } from 'lodash'
5
6 export class DemoStack extends cdk.Stack {
7   constructor(scope: cdk.Construct, id: string, props?: cdk.StackProps) {
8     super(scope, id, props)
9
10    const lambdaFn = new lambda.Function(this, 'LambdaFunction', {
11      runtime: lambda.Runtime.NODEJS_14_X,
12      code: lambda.Code.fromAsset('resources/lambda'),
13      handler: 'index.handler',
14    })
15  }
16 }
17 }
```

We can add more changes to our code to see how the snapshot responds



```
lib > TS demo-stack.ts > DemoStack > constructor > lambdaFn > description
2 import cdk = require('@aws-cdk/core')
3 import lambda = require('@aws-cdk/aws-lambda')
4 import { index0f } from 'lodash'
5
6 export class DemoStack extends cdk.Stack {
7   constructor(scope: cdk.Construct, id: string, props?: cdk.StackProps) {
8     super(scope, id, props)
9
10    const lambdaFn = new lambda.Function(this, 'LambdaFunction', {
11      runtime: lambda.Runtime.NODEJS_14_X,
12      code: lambda.Code.fromAsset('resources/lambda'),
13      handler: 'index.handler',
14      description: 'Generated on: ' + new Date().toISOString(),
15    })
16  }
17 }
18 }
```

```
ist Login: Mon May 16 20:16:10 on ttys000
~/ Desktop/dev/snapshot-demo
~/Desktop/dev/snapshot-demo/ jest
PASS src/tests/snapshot.test.ts
✓ stack matches generated snapshot (29ms)

1st Suites: 1 passed, 1 total
1sts: 1 passed, 1 total
1apshots: 1 passed, 1 total
1me: 1.197s, estimated 2s
in all test suites.
~/Desktop/dev/snapshot-demo/ jest
PASS src/tests/snapshot.test.ts
```

```
Snapshot name: 'stack matches generated snapshot 1'

- Snapshot
+ Received

@@ -55,10 +55,11 @@
    },
    },
    },
    },
  },
  "Description": "Generated on: 2022-05-17T00:21:01.473Z",
  "Handler": "index.handler",
  "Role": Object {
    "Fn::GetAtt": Array [
      "LambdaFunctionServiceRoleC555A468",
      "Arn",
    ],
  },
}

18 |
11 | it('stack matches generated snapshot', () => {
> 12 |   expect(SynthUtils.toCloudFormation(stack)).toMatchSnapshot();
    |                                     ^
13 | });
    at Object.<anonymous> (src/tests/snapshot.test.ts:12:48)

1 snapshot failed.
Snapshot Summary
1 snapshot failed from 1 test suite. Inspect your code changes or re-run jest with '-u' to update them.

1st Suites: 1 failed, 1 total
1sts: 1 failed, 1 total
1apshots: 1 failed, 1 total
1me: 3.187s
in all test suites.
~/Desktop/dev/snapshot-demo/ jest -u
PASS src/tests/snapshot.test.ts

> NPM SCRIPTS
```

```
    },
  },
  "Description": "Generated on: 2022-05-17T00:21:01.473Z",
  "Handler": "index.handler",
  "Role": Object {
    "Fn::GetAtt": Array [
      "LambdaFunctionServiceRoleC555A468",
      "Arn",
    ],
  },
}

18 |
11 | it('stack matches generated snapshot', () => {
> 12 |   expect(SynthUtils.toCloudFormation(stack)).toMatchSnapshot();
    |                                     ^
13 | });
    at Object.<anonymous> (src/tests/snapshot.test.ts:12:48)

1 snapshot failed.
Snapshot Summary
1 snapshot failed from 1 test suite. Inspect your code changes or re-run jest with '-u' to update them.

1st Suites: 1 failed, 1 total
1sts: 1 failed, 1 total
1apshots: 1 failed, 1 total
1me: 3.187s
in all test suites.
~/Desktop/dev/snapshot-demo/ jest -u
PASS src/tests/snapshot.test.ts
✓ stack matches generated snapshot (38ms)

1 snapshot updated.
Snapshot Summary
1 snapshot updated from 1 test suite.

1st Suites: 1 passed, 1 total
1sts: 1 passed, 1 total
1apshots: 1 updated, 1 total
1me: 1.408s, estimated 4s
in all test suites.
~/Desktop/dev/snapshot-demo/

> NPM SCRIPTS
```

Snapshot tests should be consistent and reliable

