DYALOG

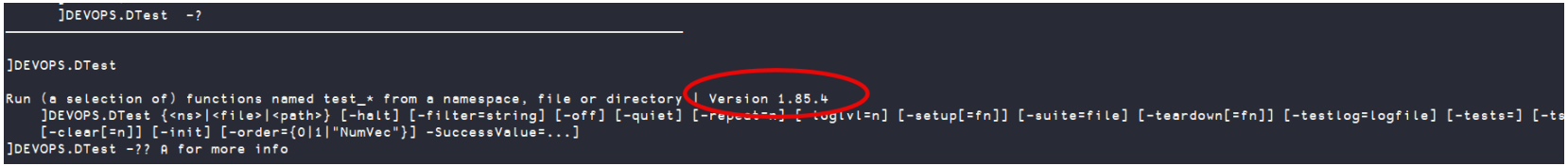
Elsinore 2023

]DTest

Michael Baas

Are you ready?

- Start Dyalog
- Same version?



- :If not ◊ :Andif v18 ◊ :Then

```
]set cmddir ",[USERPROFILE]\Documents\My UCMDs" -p
```

Scope of the workshop

- Unit testing with DTest

  ...verify the functionality
  of a specific section of code...

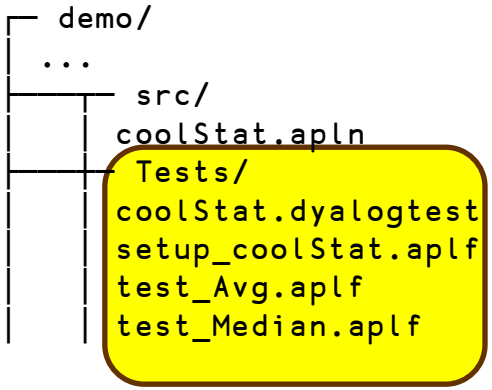
  (for APLers: "a function")

- there's more...
- Leave inspired! 😉

Organisation of files & tests

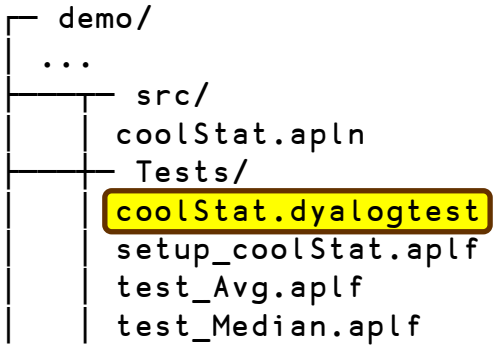
```
┌─ demo/
│  ...
├────┬─ src/
│    │  coolStat.apln
├────┼─ Tests/
│    │  coolStat.dyalogtest
│    │  setup_coolStat.aplf
│    │  test_Avg.aplf
│    │  test_Median.aplf
```

Organisation of files & tests



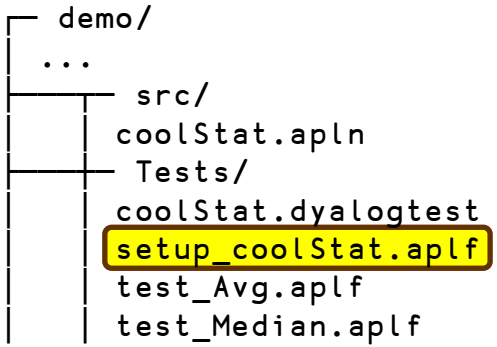
- tests live in a dedicated folder

Organisation of files & tests



- tests live in a dedicated folder
- optional .dyalogtest files define a "test suite" and are advantegous when you have multiple test suites ("basic " and "overnight") etc. or additional parameters (CodeCoverage or SuccessValue)

Organisation of files & tests



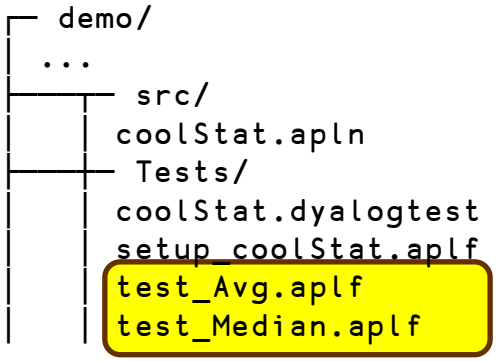
- tests live in a dedicated folder
- optional .dyalogtest files define a "test suite" and are advantegous when you have multiple test suites ("basic " and "overnight") etc. or additional parameters (CodeCoverage or SuccessValue)
- files with prefix setup_ define setups that set the stage

Organisation of files & tests

```
demo/
...
    src/
        coolStat.apln
    Tests/
        coolStat.dyalogtest
        setup_coolStat.aplf
        test_Avg.aplf
        test_Median.aplf
```

- tests live in a dedicated folder
- optional .dyalogtest files define a "test suite" and are advantegous when you have multiple test suites ("basic " and "overnight") etc. or additional parameters (CodeCoverage or SuccessValue)
- files with prefix setup_ define setups that set the stage
- the files with prefix test_ do the real work...

Organisation of files & tests



- tests live in a dedicated folder
- optional .dyalogtest files define a "test suite" and are advantegous when you have multiple test suites ("basic " and "overnight") etc. or additional parameters (CodeCoverage or SuccessValue)
- files with prefix setup_ define setups that set the stage
- the files with prefix test_ do the real work...
- and you can also have teardown_ fn that remove ~~the mess that the test created~~ any leftovers

Organisation of files & tests

```
demo/
...
    src/
        coolStat.apln
    Tests/
        coolStat.dyalogtest
        setup_coolStat.aplf
        test_Avg.aplf
        test_Median.aplf
```

- tests live in a dedicated folder
- optional .dyalogtest files define a "test suite" and are advantegous when you have multiple test suites ("basic " and "overnight") etc. or additional parameters (CodeCoverage or SuccessValue)
- files with prefix setup_ define setups that set the stage
- the files with prefix test_ do the real work...
- and you can also have teardown_ fn that remove ~~the mess that the test created~~ any leftovers

Writing tests

dfn/ test_foo1.aplf

```
test_foo1←{

    x←argL MyFn argR
```

Writing tests

dfn/ test_foo1.aplf

```
test_foo1←{

    x←argL MyFn argR

    xpct Assert x: ⍺ bla
```

{res}←a Assert b

a≡b: returns 0
a≢b: returns 1, **logs failed Assertion**

comment can also be in separate line
or
`var ⊢ a Assert b`
"var" has explanation of failure

Writing tests

dfn/ test_foo1.aplf

```
test_foo1←{

    x←argL MyFn argR

    xpct Assert x: ⍺ bla

    ''
}
```

{res}←a Assert b

a≡b: returns 0
a≢b: returns 1, **logs failed Assertion**

comment can also be in separate line
or
`var ⊢ a Assert b`
"var" has explanation of failure

Writing tests

{res}←a Check b

a≡b: returns 0
a≢b: returns 1

a←a Because b
returns a and appends b to global r

tradfn / test_foo2.dyalog

```
∇ r←test_foo2 sink

x←argL MyFn argR
r←''

:if xpct Check x
  →0 Because'test failed'
:endif
```

Writing tests

{res}←a Check b

a≡b: returns 0
a≢b: returns 1

a←a Because b
returns a and appends b to global r

tradfn / test_foo2.dyalog

```
∇ r←test_foo2 sink

x←argL MyFn argR
r←''

:if xpct Check x
  →0 Because'test failed'
:endif

2 Assert 1+1  ⍝ doc doc
```

Writing tests

{res}←a Check b

a≡b: returns 0
a≢b: returns 1

a←a Because b
returns a and appends b to global r

tradfn / test_foo2.dyalog

```
∇ r←test_foo2 sink

x←argL MyFn argR
r←''

:if xpct Check x
  →0 Because'test failed'
:endif

2 Assert 1+1  ⍝ doc doc
∇
```

]DTest

-]demo

Writing tests

.dyalogtest:

```
DyalogTest: 1.84
[SuccessValue: …]
[Setup: …]
Test: test_1
Test: test_foo
...
[Teardown: …]
```

Test function

```
∇ r←mytest sink
  ⍝ test stuff
  x←testSubj arg
  expct Assert x  ⍝ doc
∇
      OR
{
   y←testSubj arg
   [MsgVar]⊢expct Assert y: ⍝
   ...
}
```

Test DSL

`[docvar]⊢x Assert y OR x Check y`
Returns 1 if the assertion that x=y is wrong, 0 otherwise.
If –halt modifier is set, halts execution if check fails.
Additional comments on line or immediately before or after. If comments are computed, use `docvar⊢x Assert y`

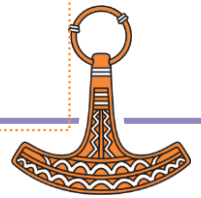
`x IsNotElement y`
test `~x∊y` and halts execution if it isn't.

`x Because y`
concatenates y to global "r" and returns x.
=> "Syntax sugar" to enable statements like:
`:if 1 Check 2 ⋄ →0 Because'1≠2!' ⋄ :endif`

`n←[id] ##.RandomVal x [y]`
generates y (default=1) random values identified by „id“ (like `[y]?x`).

`('Type' 'I|W|E')Log txt`
Adds txt to specified log (Info / Warning / Error)

Test functions need to return an empty string to indicate success. If you want to use 0 or other values, have a look at the "`SuccessValue`" modifier or add it to the .dyalogtest suite.



Running tests

]DTest {.dyalogtest | .aplf | .dyalog | path} -modifiers

Modifiers:

`-halt`: halts execution when Check or Assert fails (so that you can examine the ws)

`-trace:` trace into setup(s) and tests()

`-verbose:` show text logged with Log. (test fns should access `##.verbose` if they want to support this for ⎕←..output!)

`-quiet[=0|1]`: only shows error messages (1) or all messages (0)

`-filter=`*`aaa`*: select tests to execute (supports `*` and `?`)

`-loglvl=`*`n`*: controls the log files DTest creates. Value is a sum of the values.

1={base.log} - Errors
2={base}.warn.log - Warnings
4={base}.info.log - Informations
8={base}.session.log - Session log
16={base}.session.log - Session log ONLY for failing tests
32={base}.log.json - machine-readable results ("rc"=20: Success, 21=Failure)

`-off[=0|1]`: do (1) or do not (0) exit APL after running tests (also writes logfiles if required)

`-order[=0|1|"numvec"]`: order of tests. (0=random, 1=alphabetical, numvec specifies alternate order)

`-SuccessValue=nnn`: the value that successful tests need to return

Excercise

- Implement a test for the coolStat.Count function!
- Bonus points if you find a way to improve the implementation.
  (Is there a way to improve this (is that even possible?))

Test automation

-]demo

Automating tests

- Classic or Unicode?
- Unicode
  - LX="⎕SE.DTest ...."
  - LOAD=".../Tests" with Run.[aplf|dyalog]
- Classic
  - needs a .dws to start things
  - keep it small: ⎕LX←'⎕FIX"file:...Run.aplf"'
- loglvl=32 to get a .log.json

Code Coverage

- Careful: 100% Coverage does not mean 100% Correctness!
- 100% Coverage means that all code was executed, all possible branches were excuted.
- So IF your test cases were designed to be be wide and general (and cover ALL requirements), chances are that your code is good ;)
-]demo