DYALOG

APL Germany

News from Dyalog

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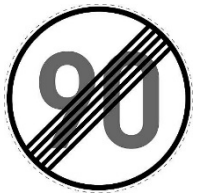
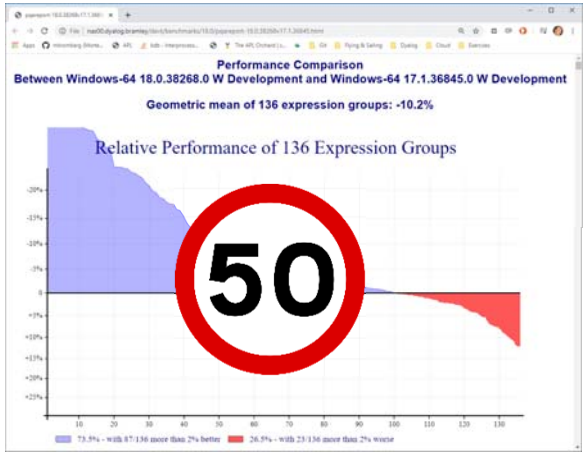
Agenda

- Current Technical Themes
- v18.0 (July 2020) - Review
- v18.1 (July 2021) - Key Features
- Next Big Things

We are slowing down



- Dyalog APL has developed at "breakneck" speed for four decades
- We nearly did break our neck in 2021
- We will invest more in
  - Quality and process (BSIMM)
  - Documentation and training materials
  - Development and integration tools



Building Security In Maturity Model

- Client organisations in sensitive sectors face demands to audit core technology providers like Dyalog
- We have decided to undertake a BSIMM audit of our development and operational practices
- In addition to allowing clients to check this box, we think this is a valuable step on the road to consistent quality and security

BSIMM

Groups of Users - Overview

- Established users of Dyalog APL
  - Large (and some small) corporations building products upon APL
  - "Internal Users"
    (departments, small groups of planners & actuaries)
  - Revenue stable or very slowly growing
- New Users
  - Refugees from other APL systems (not really "new")
  - Functional programmers attacted to
    "functional array oriented programming" (dfns)
  - Domain Experts
    (these days, users of Python, Julia, Matlab, etc)
  - Revenue still small compared to established users

Groups of Users - Requirements

Established users: Support for IT "best practices"

- Cloud Computing
- Secure [containerised] deployment
- Continuous Integration Pipelines
- And also: Attract and employ new APLers (see below)

Make APL attractive to new users

- All of the above (fortunately)
- Modern, on line training materials
- A lively on line community and open-source tools they can see and contribute to
- Ability to combine APL with Python, etc…

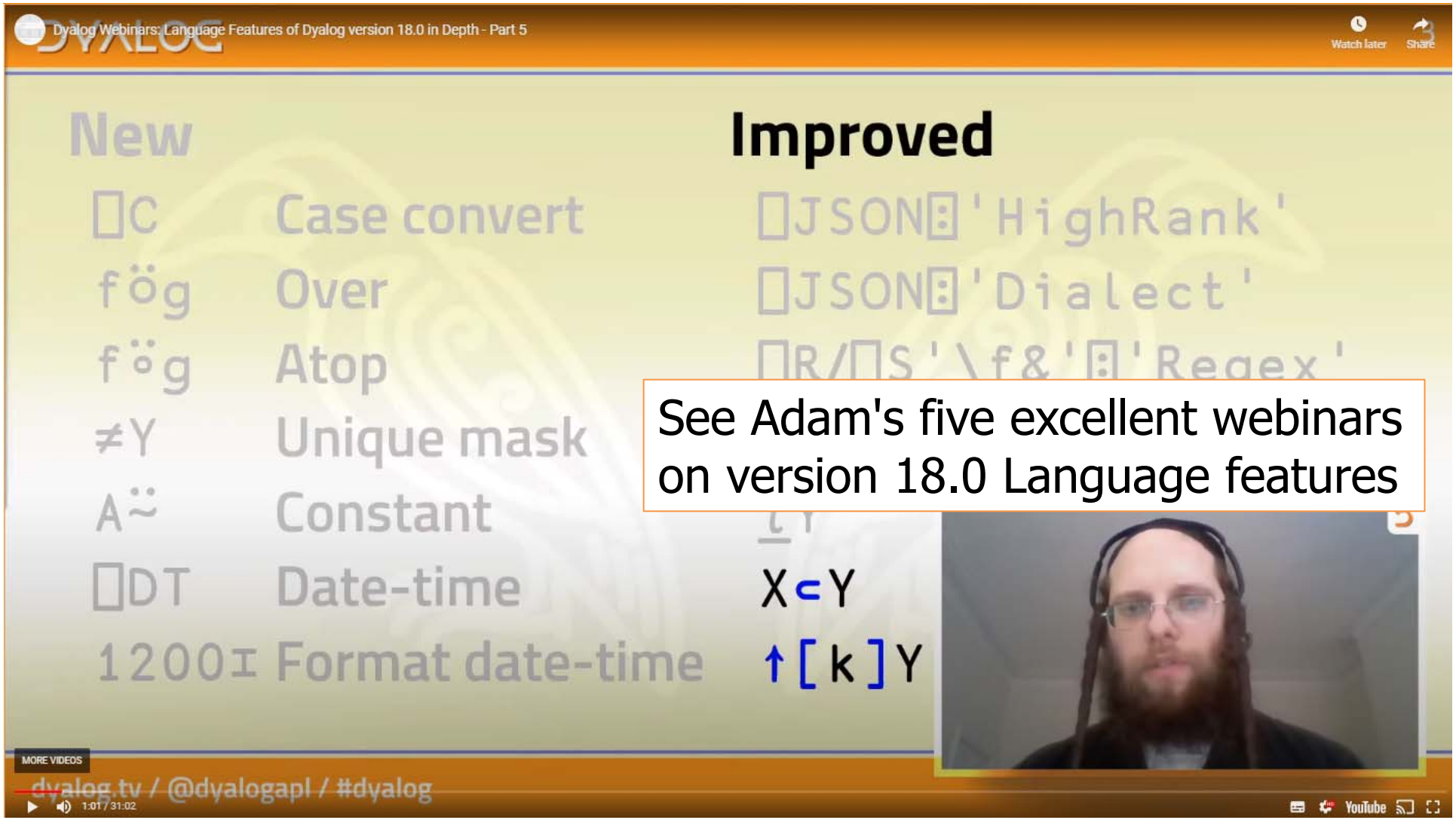
Upcoming Versions – Technical Themes

- System Integration: Tools and Frameworks
  - Editors & Source Code Management Systems
  - Scripts / Batch Processes
  - Continuous Integration
  - Containers
  - WebServices

- Portability
  - Remote IDE (RIDE) Improvements
  - .NET Bridge (Windows, macOS, Linux)
  - 64-bit ARM (MacOS, Raspbery Pi etc)

Version 18.0 – Recap: Language

- New Primitive Operators
  - ⍨ Constant
  - ⍥ Atop
  - ⍤ Over
- New Primitive Function
  - ≠ Unique Mask
- Integer (as opposed to Boolean) arguments to
  - ⍸ Where
  - ⊂ Partition


Dyalog Webinars: Language Features of Dyalog version 18.0 in Depth - Part 5
Watch later
Share
New
⎕C Case convert
f⍥g Over
f⍤g Atop
≠Y Unique mask
A⍨ Constant
⎕DT Date-time
1200⌶ Format date-time
Improved
⎕JSON⍠'HighRank'
⎕JSON⍠'Dialect'
⎕R/⎕S'\f&'⍠'Regex'
X⊂Y
↑[k]Y
See Adam's five excellent webinars on version 18.0 Language features
MORE VIDEOS
dyalog.tv / @dyalogapl / #dyalog
1:01 / 31:02
YouTube

Version 18.0 Recap - Interfaces

- Extensions to ⎕JSON (new Variant options):
  - **HighRank:** As JavaScript does not have arrays of rank >1, when exporting from APL, split to create vectors of vectors (of vectors…).
  - **Dialect:** Support "JSON5" extensions which include comments and more user-friendly formatting (for our own Configuration files).

- .NET [Core] Bridge
  - The Microsoft.NET **Framework** is being replaced by an open source, portable platform available for Windows, macOS, Linux, Android, iOS, tvOS and watchOS
    - At this time, Dyalog APL is only available for Windows, macOS, Linux
  - Was called ".NET Core", in the future just ".NET 5.0"
  - Version 18.0 added a bridge which supports **USE** of .NET Libraries

Version 18.0 Recap - Application Tools

- Case folding with ⎕C (replaces 819⌶)

```
      1 ⎕C 'Hello' (⎕NS'') (1 2 3)
HELLO  #.[Namespace]  1 2 3
```

- Date / Time manipulation with ⎕DT

```
      1 ⎕DT ⊂⎕TS ⍝ TS to fractional day number
44319.66611

    '__de__Dddd, DDoo mmmm YYYY; hh:mm:ss' (1200⌶) dt
Dienstag, 04. mai 2021; 15:59:12
```

Version 18.0 Recap: Launch on Source Files

- Pre-18.0 interpreters can be launched on
  - a binary workspace (.dws)
  - a "dyalog application file" (.dyapp, now deprecated)
- Version 18.0 allows ANY APL source file.
- APL can automatically start running:
  - Functions (.aplf)
  - Namespaces (.apln)
  - Classes (.aplc)
- For other types of files, you must also specify the `LX=` parameter

Version 18.0 Recap: Configuration Files

- Identical across platforms
- Easily readable & editable
- Cascading configuration files provide flexible configuration of
  - each application
  - each version of APL
  - each user

App.dcfg - Notepad

File Edit Format View Help

```
{ Settings: {
  /* Dyalog Configuration */
  maxws: "128M",

  /* Application Configuration */
  app_server_port: 5556,
  use_secure_sockets: 1,
  }
}
```

Version 18.1 Summary

A "small" release, with a lot of internal work on testing frameworks, and new tests to go with them, to guarantee future quality

- Shebang (#!) scripting
- Link 3.0 for text source management
- Remote IDE (RIDE) 4.4 (focus on debugging threaded services)
- Easier-to-use docker containers
- Jarvis for HTTP/REST services
- ⎕JSON representation of tables
- Non-Linear Random Distributions
- A lot of work on the "issue backlog" + lots of testing

Version 18.1: Application Tools

- Non-linear Random Distributions (Experimental)
- Jarvis – for RESTful or simple HTTP/JSON services
- ⎕JSON extension for representing matrices

Non-Linear Distributions (16808⌶)

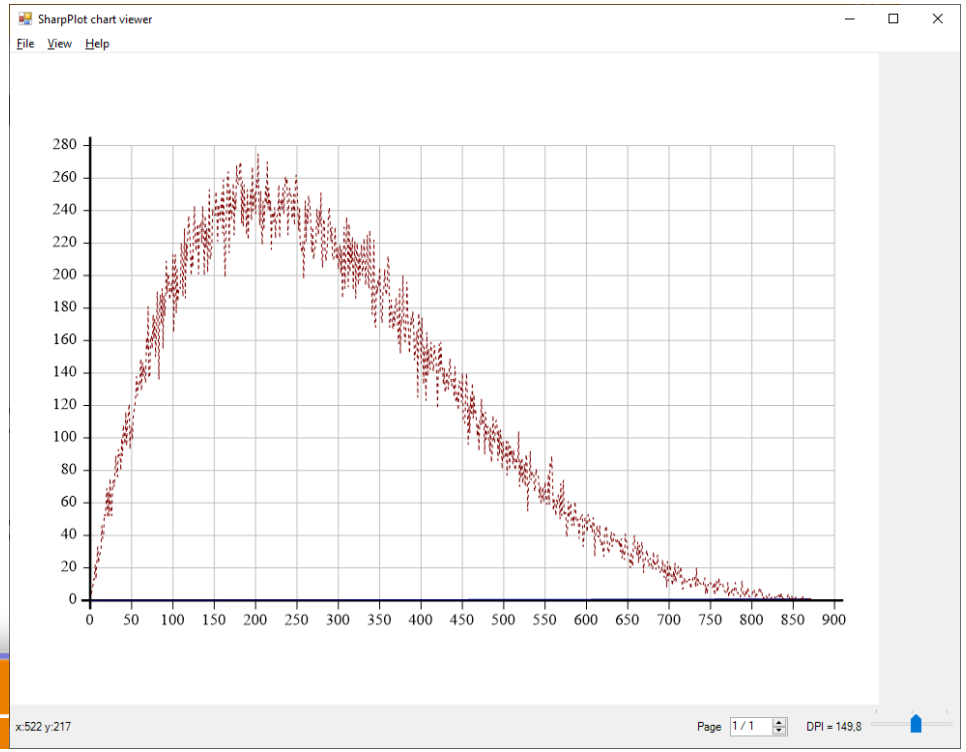
Some distributions are difficult to generate accurately **AND** efficiently in APL

Distribution	Parameter 1	Parameter 2	Domain Rules
"Uniform"	a	b	a < b ; A numeric interval. Example: 1.0 7.6
"Beta"	a	b	a > 0 AND b > 0
"Bernoulli"	probability		probability ≥ 0 AND probability ≤ 1
"Binomial"	trials	probability	trials is an integer ≥ 0; probability ≥ AND probability ≤ 1
"Cauchy"	location	scale	location unrestricted; scale > 0
"Chi Squared"	degree_of_freedom		degree_of_freedom ≥ 0
"Exponential"	rate		rate ≥ 0
"F"	a	b	a ≥ eps AND b ≥ eps ; eps is smallest non-zero positive float number
"Gamma"	a	b	a ≥ 0 AND b ≥ eps ; eps is smallest non-zero positive float number
"Inverse Gamma"	a	b	a ≥ 0 AND b ≥ 0
"Laplace"	location	scale	location unrestricted; scale ≥ 0
"Logistic"	location	scale	location unrestricted; scale ≥ 0
"Log Normal"	location	scale	location unrestricted; scale ≥ 0
"NormaL"	location	scale	location unrestricted; scale ≥ 0
"Poisson"	rate		rate ≥ 0
"Student T"	degree_of_freedom		degree_of_freedom ≥ eps ; eps is smallest non-zero positive float number
"Weibull"	a	b	a ≥ eps AND b ≥ eps ; eps is smallest non-zero positive float number

Non-Linear Distributions ...

Syntax: parameters (16808⌶) distribution shape

```
RAND←16808⌶
rv←2 5 RAND 'Beta' 100000
bc←1000 BucketCounts rv
]chart bc
```



v18.1
Application Tools

- Generate JSON from 3 common APL representations of tables
- Useful when writing web services

```
      ⎕ML←3 ⍝ Germany
      Fields←'Item' 'Price' 'Qty'
      Items←'Knife' 'Fork'
      Price←3 4 ⋄ Qty←23 45

      ⎕←mat←Fields,⊃[1]Items Price Qty
 Item   Price  Qty
 Knife      3   23
 Fork       4   45

      ⎕JSON ⊂2 mat
      ⎕JSON ⊂3 (Fields(⊃[1]Items Price Qty))
      ⎕JSON ⊂4 (Fields(Items Price Qty))
[{
    "Item": "Knife",
    "Price": 3,
    "Qty": 23
  },{
    "Item": "Fork",
    "Price": 4,
    "Qty": 45
  }]
```

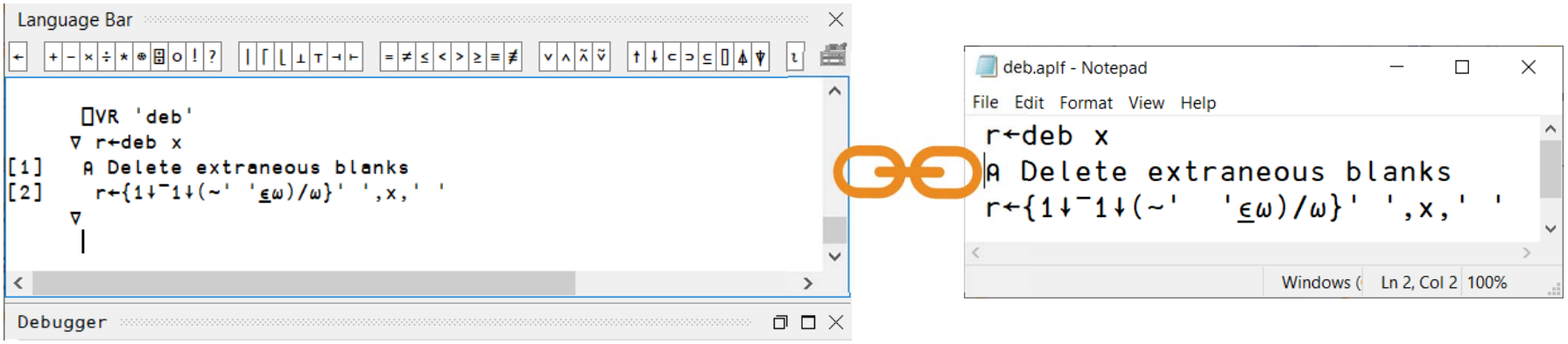
Multi-Line Input

- Experimental in v18.0, enabled with an optional switch
- On by default in v18.1 scripting mode (see next presentation)
- Allows multi-line input statements in the session
  - Control structures
  - Multi-line dfns
  - In the (hopefully near) future: "Array Notation"

Link 3.0

IMPORTANT

What is Link?



- Each code item in the active workspace is **link**ed to a file
- If the object is edited, the file is updated
- If the file is changed, the workspace is updated
- More in the next session

Jarvis (released separately)

Json
And
Rest
serVIS

If you have one or more APL functions, Jarvis can make them available as a web service

- Deploy APL code as a pragmatic HTTP/JSON service, or as a "RESTFul" service if you master that paradigm
- **Jarvis** combines and replaces **JSONServer** and **RESTServer**
- Can also replace **MiServer** for serving static HTTP
- About to add WebSocket publish/subscribe capability

A high percentage of new projects use Jarvis.

- Public repository at https://github.com/Dyalog/Jarvis

RIDE 4.4 (with Dyalog v18.1)

- Tested and enhanced for debugging **multi-threaded server applications**
- More sensitive to the active version of APL
  - Language Bar, Online Help, Syntax Colouring ...
- Remember responses to confirmation prompts
- Support multi-line input
- Documentation / examples of secure RIDE configuration
  - E.g. how to require client-side certificates

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Some of the Next "Big Things"

Targeting v19.0 (Q3 2022)

- Package Manager
- .NET bridge: Support Async & Generics
- 64-Bit ARM Ports (macOS & Pi/Linux)
- Array Notation

Tatin

Finally! (We've been talking about this for years...)

- Tatin: APL Package Manager
  https://tatin.dev

- Developed by Kai Jaeger / APLTeam
  Co-funded by Dyalog
- Still a prototype with rudimentary documentation
- Currently only has Kai's own tools as packages
- Dyalog will add tools as packages once 18.1 is done

Tatin

tatin.dev

Apps Git Flying & Sailing Dyalog Cloud Exercises SBO Travel Linux Sport APL Productivity Reading list

Tatin Registry

Main page

This is the Tatin Registry. It holds packages designed to be used under Dyalog APL.

1. List of all groups
2. List of all packages, aggregated by major version no.
3. List of all tags
4. List of all packages
5. Documentation Center
6. Version information regarding Tatin

This server operates a "delete none" policy: once published, packages cannot be deleted.

Created by Tatin version 0.38.2.524 from 2021-04-30 under Linux-64 18.0.40044.0 S Development

Tatin

tatin.dev/v1/packages

Apps Git Flying & Sailing Dyalog Cloud Exercises SBO Travel Linux Sport APL Productivity Reading list

Tatin Registry

List of all packages

Package name	Description	Major versions	Link to project
apl team-APLGit	Git interface from Dyalog APL via Git Bash	1	github.com
apl team-APLProcess	Start an APL process from within Dyalog APL	1	github.com
apl team-APLTreeUtils2	General utilities required by most members of the APLTree library	1	github.com
apl team-CodeCoverage	Monitors which parts of an application got actually executed	1	github.com
apl team-Compare	Allows comparing and merging objects in the workspace with a file or a file with another file	1	github.com
apl team-CompareSimple	Allows comparing objects in the workspace with a file or a file with another file	1	github.com
apl team-DateAndTime	Utilities related to Date and Time, including doing math	1	github.com
apl team-DotNetZip	Zipping and unzipping with.NET Core on all major platforms	1	github.com
apl team-EventCodes	Constants with meaningful names for Dyalog error codes	1	github.com
apl team-Execute	Start a process from within APL	1	github.com
apl team-FilesAndDirs	Utilities for doing gymnastics with files and directories	1	github.com
apl team-GitHubAPIv3	Utilities for dealing with GitHub repositories	1	github.com
apl team-HandleError	Allows to catch errors on an application level; saves information that allow analyzing the error	1	github.com
apl team-IniFiles	Allows instantiating good old INI files in APL; comes with extended syntax supporting APL-like data structures	1	github.com
apl team-Laguntza	Managing and displaying help pages based on markdown files	1	github.com
apl team-Logger	Allows writing to LOG files; (almost) guaranteed to never break the application	1	github.com
apl team-MarkAPL	Converts Markdown to HTML5	1	github.com
apl team-OS	OS-related tools for all major platforms	1	github.com

CLEAR WS - Dyalog APL/W-64

File Edit View Windows Session Log Action Options Tools Threads Help

```
      ]tatin.ListPackages [tatin]
Group     Package Name      Major
-----     ------------      -----
aplteam   OS                3
aplteam   ShowChmHelp       3
aplteam   APLTreeUtils2     1
aplteam   CompareSimple     4
aplteam   WinSys            5
aplteam   Logger            5
aplteam   IniFiles          5
aplteam   EventCodes        3
aplteam   Execute           3
aplteam   DotNetZip         1
aplteam   FilesAndDirs      4
aplteam   HandleError       4
aplteam   CodeCoverage      0
aplteam   WinRegSimple      3
aplteam   WinReg            5
aplteam   ServiceState      3
aplteam   WindowsEventLog   3
aplteam   Tester2           3
```

Ready... Ins

CurObj: tatin (Undefined) &:1 ⎕DQ:0 ⎕TRAP ⎕SI:0 ⎕IO:1 ⎕ML:1

CLEAR WS - Dyalog APL/W-64

File Edit View Windows Session Log Action Options Tools Threads Help

```
      )ns myns
#.myns
      myns.⎕FX 'r←goo x' ':If x=1' 'r←''x is one''' ':Else' 'r←''x is not one''' ':EndIf'
      ⎕VR 'myns.goo'
    ∇ r←goo x
[1]   :If x=1
[2]       r←'x is one'
[3]   :Else
[4]       r←'x is not one'
[5]   :EndIf
    ∇

      ]tatin.loadpackage [tatin]/apl team-CodeCoverage  #.MyPkgs
 #.MyPkgs.CodeCoverage
      C←⎕NEW #.MyPkgs.CodeCoverage(,⊂'#.myns')
      C.filename←'/tmp/myns-coverage'
      C.Start 0

      myns.goo 1
x is one

      C.Stop 0
      C.Finalize 0
/tmp/myns-coverage.dcf
      ⎕←1 #.MyPkgs.CodeCoverage.ProcessDataAndCreateReport C.filename
/tmp/myns-coverage.html
```

NB: If CodeCoverage had any dependencies, they would also have been loaded

Ready... Ins

CurObj: apl team (Undefined) &:1 ⎕DQ:0 ⎕TRAP ⎕SI:0 ⎕IO:1 ⎕ML:1

Coverage

File | C:/Users/mkrom/AppData/Local/Microsoft/Windows/INetCache/Content.Outlook/D4IK6FWZ/CodeCoverage-2020118118229.html

Apps mkromberg (Morte... APL kdb - Interprocess... The APL Orchard | c... Git Flying & Sailing Dyalog Cloud Exercises SBO Travel Linux

Coverage Report

Watched: 1 fns/opr within `#.goo`

Overall 67% of the testable code is covered.

(Comment lines, empty lines, all `:End*` lines etc. are all ignored)

0 of the fns/opr are 100% covered.

1 are partly covered:

Function/Operator	Lines not executed	Coverage	≠
#.goo.goo	4	67%	3

Listings

#.goo.goo ↑ ↑

```
 r←goo x
 [1]  :If x=1
 [2]      r←'x is one'
 [3]  :Else
→[4]      r←'x is not one'
 [5]  :EndIf
```

Created by "CodeCoverage" version 0.6.2.26 from 2020-11-07

.NET Async and Generics

- Asyncronous methods are growing in popularity
  - We need to find a good way to integrate this into APL
  - (perhaps using Futures)
- The same is true for "generic" classes and methods
- We will do research into this in the v19.0 timeframe
- Also extend .NET bridge to allow export of APL code as .NET assemblies and executables

ARM 64 Ports

- Apple is moving from Intel/x64 to ARM-64
- Raspberry Pi and similar small machines are switching from 32- to 64-bit ARM

Array Notation

- Currently "modelled" in Link, will become a core language feature
- Will make it easier to
  - Write (and read) code
  - Define and edit data in the APL session
    - Or in external editors
  - Effectively use source code management systems
  - Configure and deploy systems
- Proposals refined for 5+ years
  - Many thanks to Phil Last!
  - Planning a final round of community review

```
colours←[
  'red'    (255   0   0)
  'orange' (255 165   0)
  'purple' (128   0 128)
  'green'  (  0 255   0)
  'blue'   (  0   0 255)
  'gray'   (128 128 128)
]
```

"Slowing Down" ...

...

- Package Manager
- .NET bridge: Support Async & Generics
- 64-Bit ARM Ports (macOS & Pi/Linux)
- Array Notation

- Documentation work, co-dfns compiler, etc...
- Increased testing of interpreter + all tools