DYALOG

Glasgow 2024

EWC = Everywhere WC

Morten Kromberg

Why EWC?

1. Protect existing investments

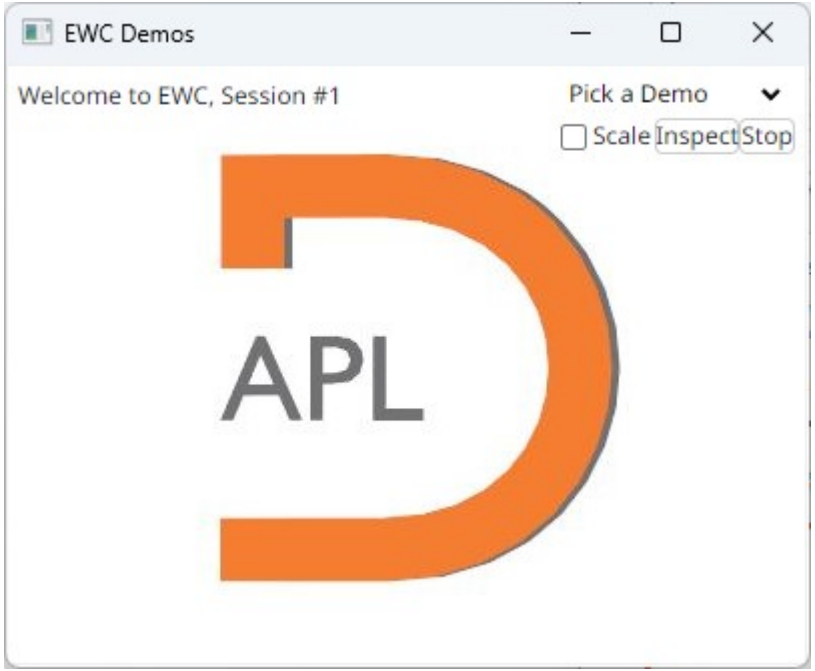
- Since 1990, □WC has made it possible for domain experts to be ”full stack” developers
- □WC is perhaps the most important reason why Dyalog has been successful
- □WC is is restricted to the Microsoft Windows desktop, which is fading

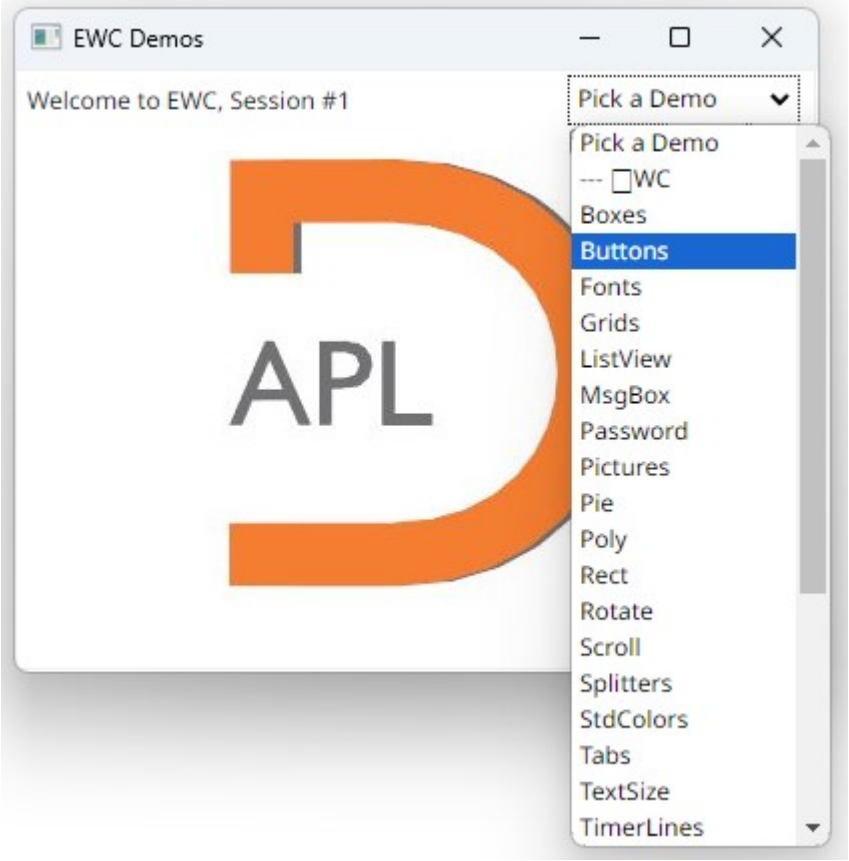
Why EWC?

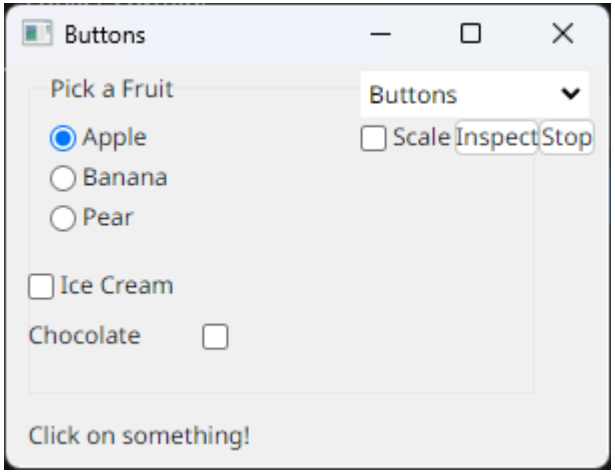
2. Build New Applications

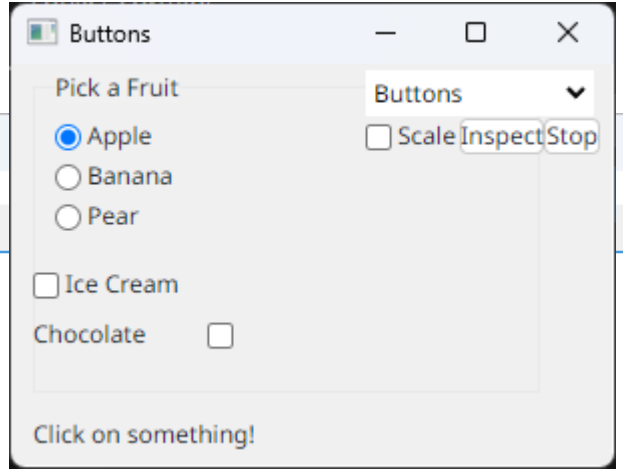
- EWC can easily be extended with JavaScript libraries
- Potential migration path for existing code to ”responsive” layout
  - Replace Posn/Size with Flex CSS
- EWC is a uniquely interactive web development environment

demo.Run 'Desktop'




EWC Demos
Welcome to EWC, Session #1
Pick a Demo
Pick a Demo
--- WC
Boxes
Buttons
Fonts
Grids
ListView
MsgBox
Password
Pictures
Pie
Poly
Rect
Rotate
Scroll
Splitters
StdColors
Tabs
TextSize
TimerLines
APL


Buttons
Pick a Fruit
Buttons
Apple
Banana
Pear
Scale
Inspect
Stop
Ice Cream
Chocolate
Click on something!



Editor - [demo.DemoButtons in C:/devt/jswc/demo/DemoButtons.aplf]

File Edit Syntax Window Refactor View

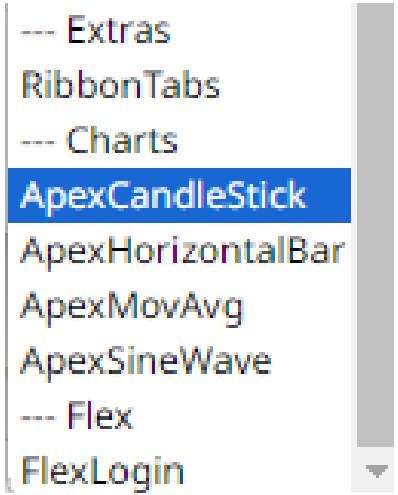
Search...

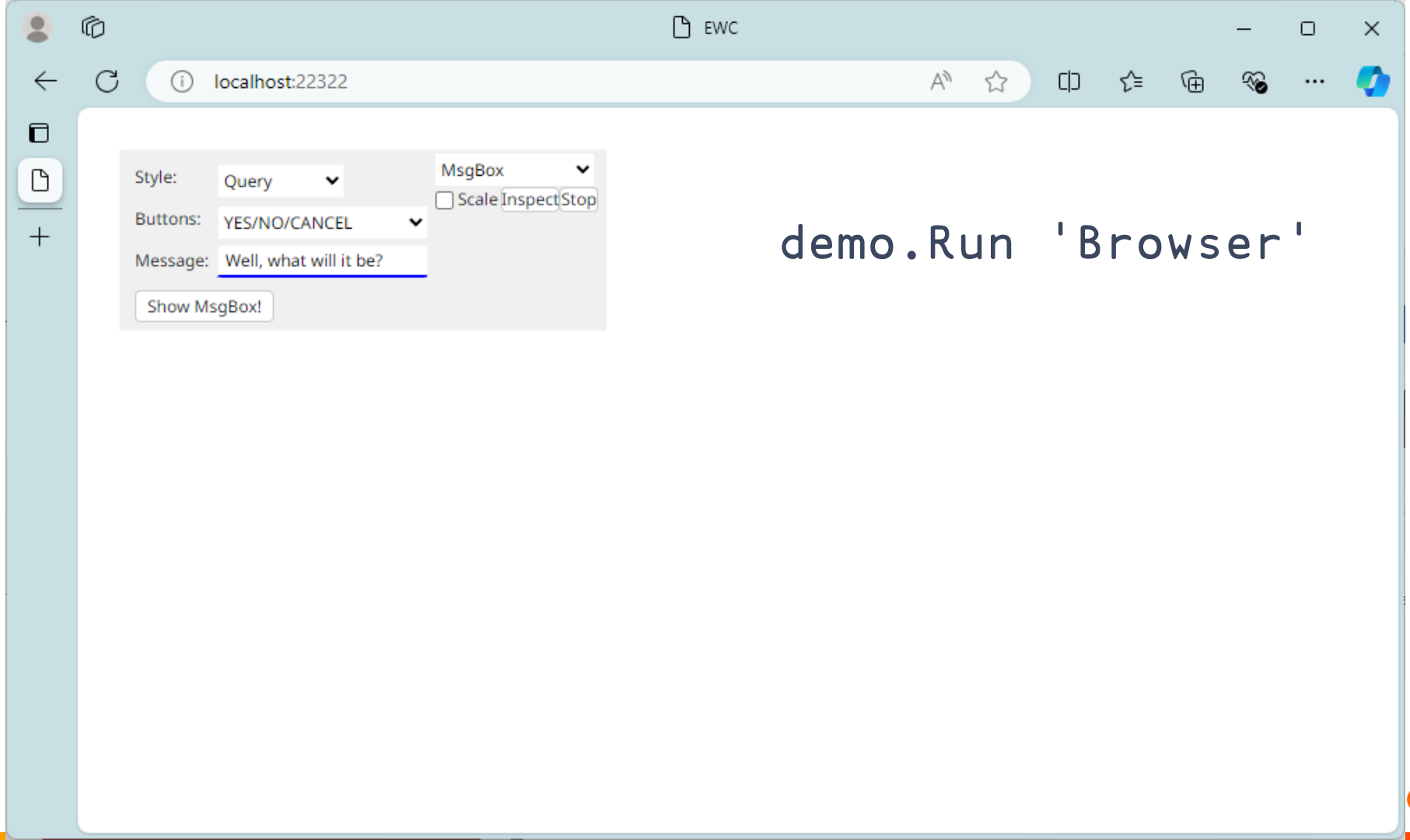
```
DemoButtons connected;F
EWC.CONNECTED←connected
⎕PW←1000

F←'F1'
F eWC'Form' 'Buttons'(50 50)(200 300)('Coord' 'Pixel')

(F,'.FRUIT')eWC'Group' 'Pick a Fruit'('Posn'(10 10))('Size'(80 280))
(F,'.FRUIT.C1')eWC'Button' 'Apple'(13 10)(23 100)('Style' 'Radio')('Event' 'Select' 'CBUpdateButtons')('State' 1)
(F,'.FRUIT.C2')eWC'Button' 'Banana'(33 10)(23 100)('Style' 'Radio')('Event' 'Select' 'CBUpdateButtons')
(F,'.FRUIT.C3')eWC'Button' 'Pear'(53 10)(23 100)('Style' 'Radio')('Event' 'Select' 'CBUpdateButtons')

(F,'.ICE')eWC'Button' 'Ice Cream'(100 10)(23 100)('Style' 'Check')('Event' 'Select' 'CBUpdateButtons')('Align' 'Right')
(F,'.CHOKO')eWC'Button' 'Chocolate'(125 10)(23 100)('Style' 'Check')('Event' 'Select' 'CBUpdateButtons')('Align' 'Left')

(F,'.STATUS')eWC'Label' 'Click on something!'(175 10)(23 300)
```

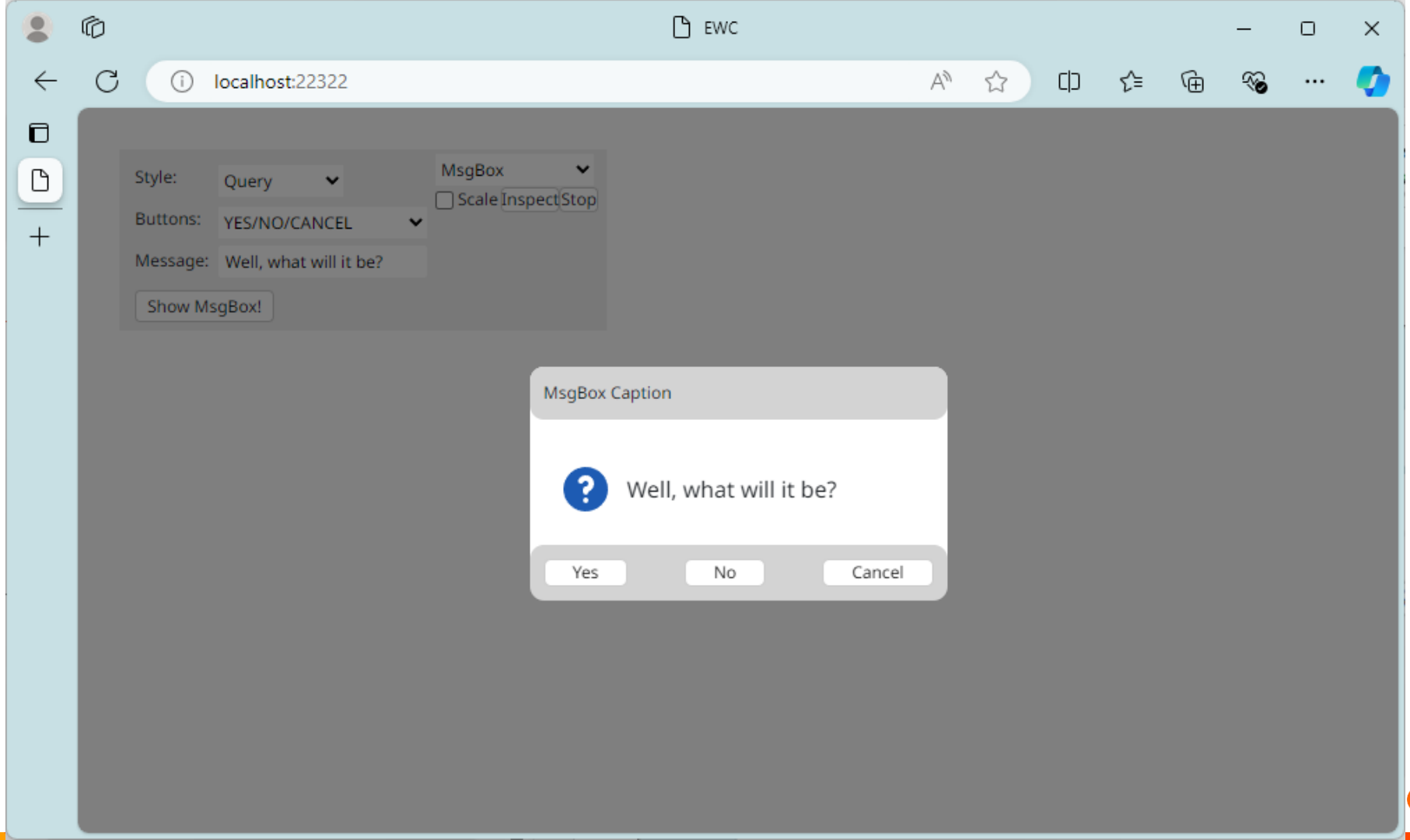
Function | Last saved by: mkrom: 10-09-2024 21:49 | Pos: 0/16,1

The Demo

- Demos of Extensions




EWC
localhost:22322
Style:
Query
MsgBox
Buttons:
YES/NO/CANCEL
Scale
Inspect
Stop
Message:
Well, what will it be?
Show MsgBox!
demo.Run 'Browser'


EWC
localhost:22322
Style:
Query
MsgBox
Scale
Inspect
Stop
Buttons:
YES/NO/CANCEL
Message:
Well, what will it be?
Show MsgBox!
MsgBox Caption
Well, what will it be?
Yes
No
Cancel

Function Table

File Colours Focus

Name	Gender	Score	Expert
Amir	Male	12	☐
Fatima	Female	13	☑

Expanding on node #15

- Q1
- Q2
  - Apr
  - May
    - In
    - Out
  - Jun

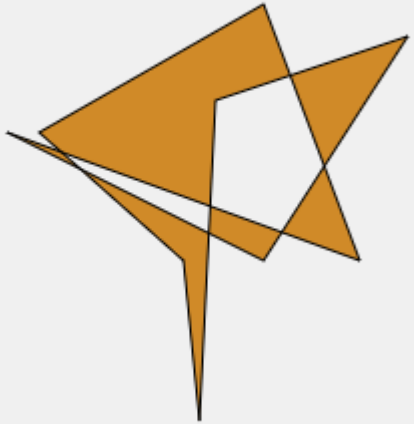
11 × Calc ••••••••

	A	B	C	D	E	F
1	1	2	3	4	5	
2	2	4	6	8	10	1
3	3	6	9	12	15	1
4	4	8	12	16	20	2
5	5	10	15	20	25	3
6	6	12	18	24	30	3
7	7	14	21	28	35	4
8	8	16	24	32	40	4
9	9	18	27	36	45	5
10	10	20	30	40	50	6

PolyLine

Poly

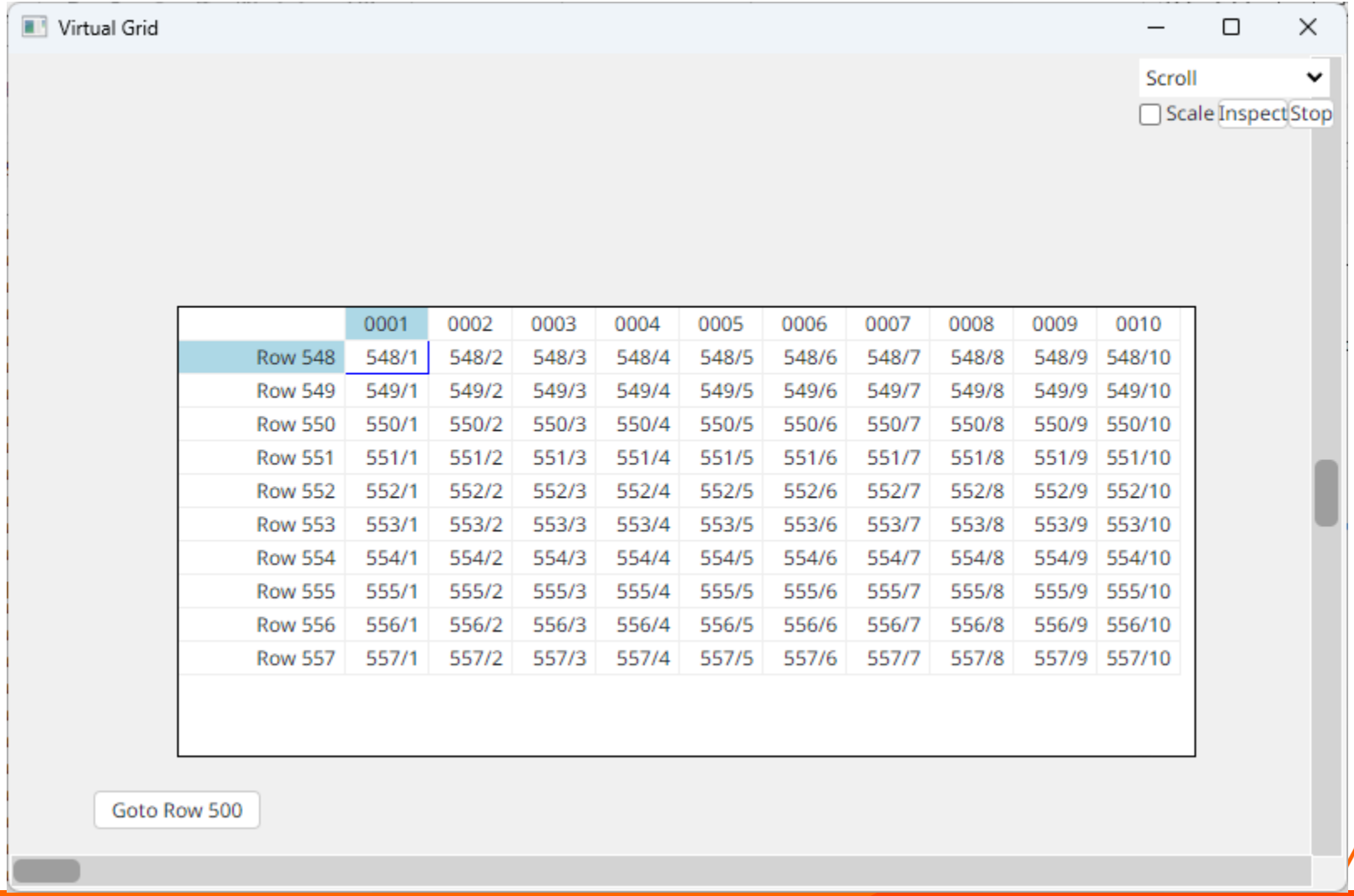
Scale Inspect Stop

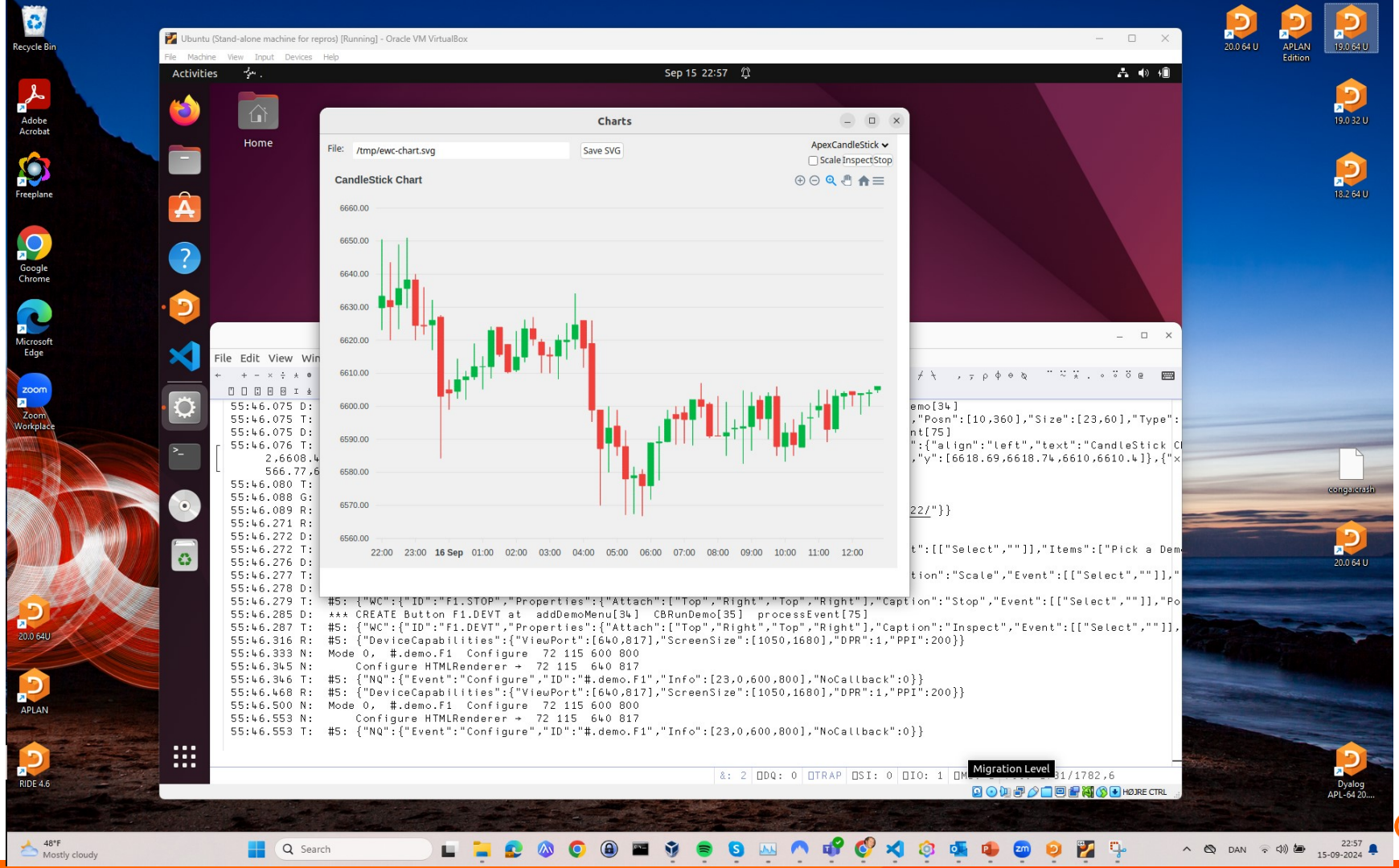


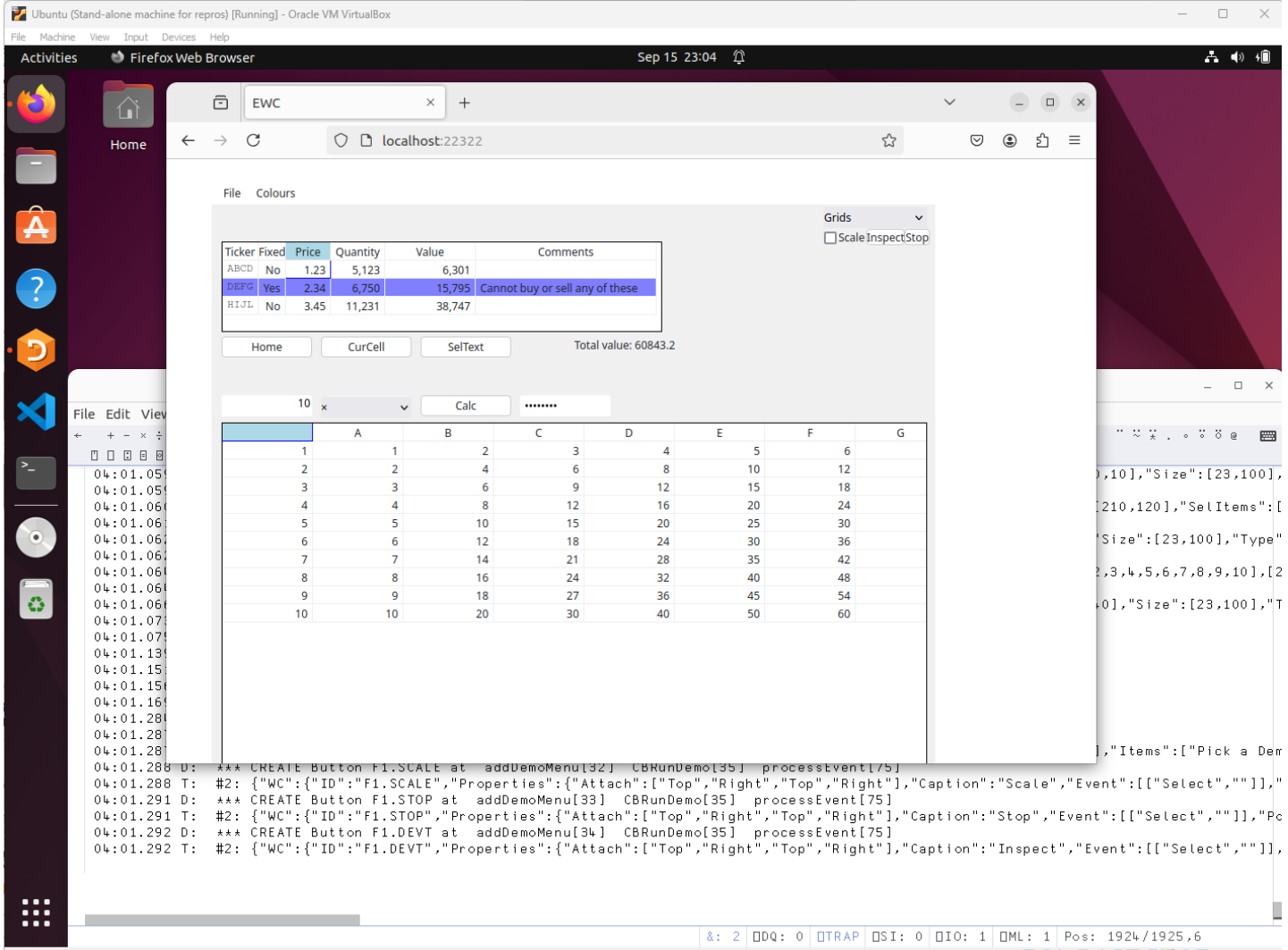
Rect

Rect

Scale Inspect Stop


Virtual Grid
Scroll
Scale
Inspect
Stop
0001 0002 0003 0004 0005 0006 0007 0008 0009 0010
Row 548 548/1 548/2 548/3 548/4 548/5 548/6 548/7 548/8 548/9 548/10
Row 549 549/1 549/2 549/3 549/4 549/5 549/6 549/7 549/8 549/9 549/10
Row 550 550/1 550/2 550/3 550/4 550/5 550/6 550/7 550/8 550/9 550/10
Row 551 551/1 551/2 551/3 551/4 551/5 551/6 551/7 551/8 551/9 551/10
Row 552 552/1 552/2 552/3 552/4 552/5 552/6 552/7 552/8 552/9 552/10
Row 553 553/1 553/2 553/3 553/4 553/5 553/6 553/7 553/8 553/9 553/10
Row 554 554/1 554/2 554/3 554/4 554/5 554/6 554/7 554/8 554/9 554/10
Row 555 555/1 555/2 555/3 555/4 555/5 555/6 555/7 555/8 555/9 555/10
Row 556 556/1 556/2 556/3 556/4 556/5 556/6 556/7 556/8 556/9 556/10
Row 557 557/1 557/2 557/3 557/4 557/5 557/6 557/7 557/8 557/9 557/10
Goto Row 500


Ubuntu (Stand-alone machine for repros) [Running] - Oracle VM VirtualBox
Activities
Sep 15 22:57
Charts
File: /tmp/ewc-chart.svg
Save SVG
ApexCandleStick
Scale InspectStop
CandleStick Chart
6660.00
6650.00
6640.00
6630.00
6620.00
6610.00
6600.00
6590.00
6580.00
6570.00
6560.00
22:00 23:00 16 Sep 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00
Migration Level
Recycle Bin
Adobe Acrobat
Freeplane
Google Chrome
Microsoft Edge
Zoom Workplace
20.0 64U
APLAN
RIDE 4.6
Home
20.0 64 U
APLAN Edition
19.0 64 U
19.0 32 U
18.2 64 U
conga.crash
Dyalog APL-64 20....
48°F Mostly cloudy
Search
DAN
22:57
15-09-2024


Ubuntu (Stand-alone machine for repros) [Running] - Oracle VM VirtualBox
Activities
Firefox Web Browser
Sep 15 23:04
Home
EWC
localhost:22322
File Colours
Grids
Scale Inspect Stop
Ticker Fixed Price Quantity Value Comments
ABCD No 1.23 5,123 6,301
DEFG Yes 2.34 6,750 15,795 Cannot buy or sell any of these
HIJL No 3.45 11,231 38,747
Home CurCell SelText
Total value: 60843.2
10 × Calc
A B C D E F G
1 1 2 3 4 5 6
2 2 4 6 8 10 12
3 3 6 9 12 15 18
4 4 8 12 16 20 24
5 5 10 15 20 25 30
6 6 12 18 24 30 36
7 7 14 21 28 35 42
8 8 16 24 32 40 48
9 9 18 27 36 45 54
10 10 20 30 40 50 60
File Edit View
04:01.288 D: *** CREATE Button F1.SCALE at addDemoMenu[32] CBRunDemo[35] processEvent[75]
04:01.288 T: #2: {"WC":{"ID":"F1.SCALE","Properties":{"Attach":["Top","Right","Top","Right"],"Caption":"Scale","Event":[["Select",""]],"
04:01.291 D: *** CREATE Button F1.STOP at addDemoMenu[33] CBRunDemo[35] processEvent[75]
04:01.291 T: #2: {"WC":{"ID":"F1.STOP","Properties":{"Attach":["Top","Right","Top","Right"],"Caption":"Stop","Event":[["Select",""]],"Pc
04:01.292 D: *** CREATE Button F1.DEVT at addDemoMenu[34] CBRunDemo[35] processEvent[75]
04:01.292 T: #2: {"WC":{"ID":"F1.DEVT","Properties":{"Attach":["Top","Right","Top","Right"],"Caption":"Inspect","Event":[["Select",""]],
&: 2 DQ: 0 TRAP SI: 0 IO: 1 ML: 1 Pos: 1924/1925,6
HØJRE CTRL

DYALOG

EWC User Guide

Overview
Introduction
Implementation
EWC versus ⎕WC
Images

Getting Started
Installation
Initialising an EWC session
Configuration

Supported Features
Classes
ApexChart
BitMap
Button
Circle
Combo
Edit
Ellipse
Font
Form

Initialising an EWC session

Once you have a folder on your machine containing EWC, you can load it into a Dyalog APL session (18.2 or later is required):

```
]link.import # /path/to/ewc
```

Where `/path/to/ewc` is the name of the folder that you created during installation.

EWC.Init

The function EWC.Init takes a right argument of the mode that you want to enable:

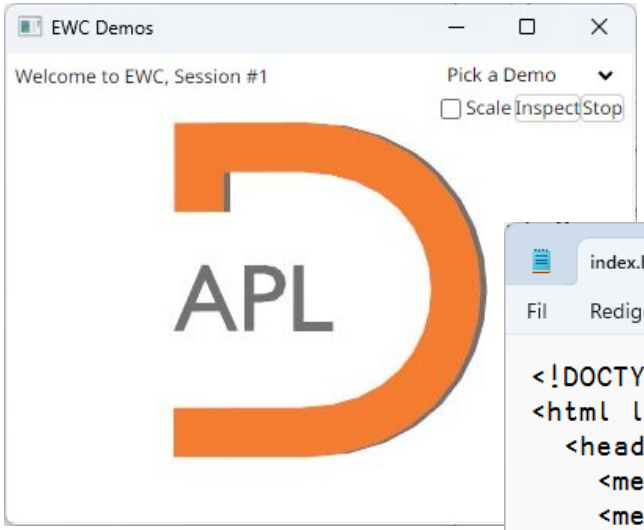
- 'Desktop' to run each form in an HTMLRenderer
- 'Browser' to allow a single session from a browser
- 'Multi' to allow multiple sessions from browsers (more about that later)

For example:

```
EWC.Init 'Desktop'
```

`EWC.Init` will also create cover-functions `eWC`, `eWS` and so on, in the namespace from which Init was called. These are intended to be used as replacements for the system functions `⎕WC`, `⎕WS`, etc.

How Does it Work?



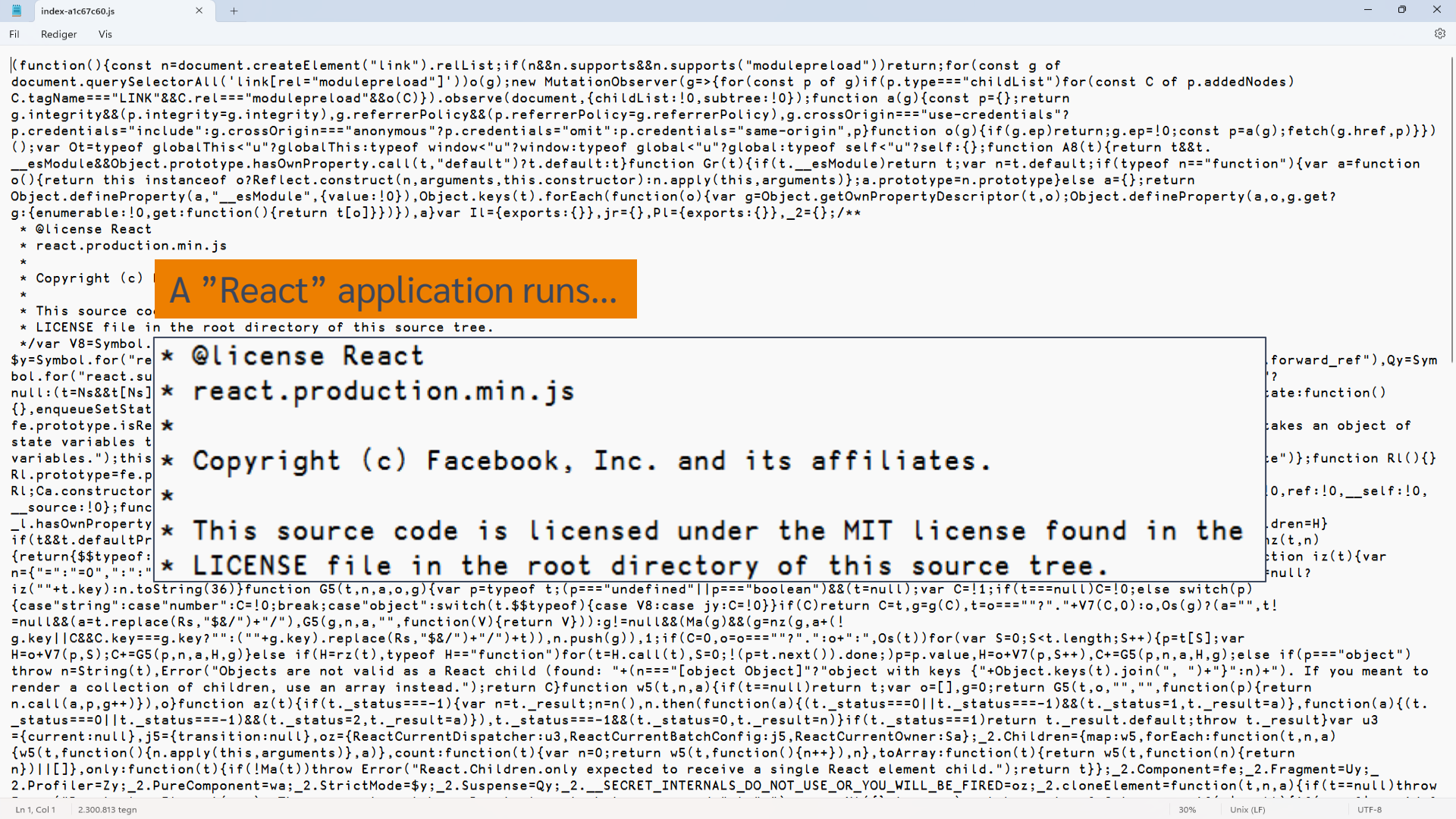
- Conga server is created listening on port 22322
- HTMLRenderer or Web Browser launched at http://localhost:22322/index.html

index.html

Fil Rediger Vis

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0" />
    <title>EWC</title>
    <script type="module" crossorigin src="/assets/index-a1c67c60.js"></script>
    <link rel="stylesheet" href="/assets/index-5981879a.css">
  </head>
  <body>
    <div id="root"></div>w
  </body>
</html>
```

Ln 11, Col 27 381 tegn 30% Unix (LF) UTF-8


index-a1c67c60.js
Fil
Rediger
Vis
A ”React” application runs...
* @license React
* react.production.min.js
*
* Copyright (c) Facebook, Inc. and its affiliates.
*
* This source code is licensed under the MIT license found in the
* LICENSE file in the root directory of this source tree.
Ln 1, Col 1
2.300.813 tegn
30%
Unix (LF)
UTF-8

A WebSocket is Born

Log messages are timestamped mm.ss.ttt since session start.
R=Receive, T=Transmit, C=Create

```
07:53.071 C:  Socket connected from [::1]:57082
```

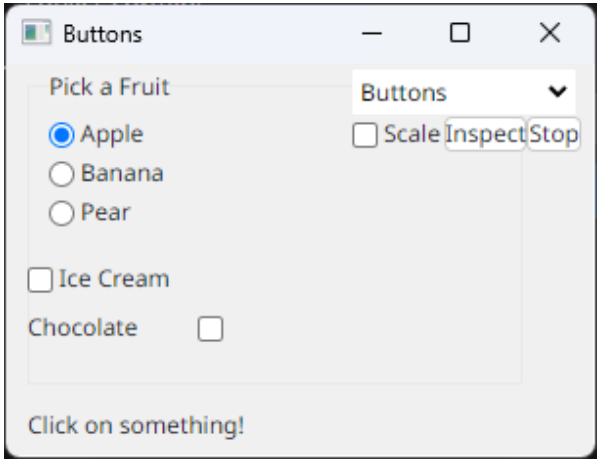
JavaScript Client tells us something about it's environment:

```
07:53.077 R:  #2: {"DeviceCapabilities":
                  {"ViewPort":[301,401],"ScreenSize":[1440,2560],"DPR":1,"PPI":200}}
07:53.083 R:  #2: {"Initialise":
                  {"Version":"0.2.0","Name":"EWC Client","URL":"http://localhost:22322/"}}
```

APL Server says how it wants things (you can customise these):

```
07:53.134 T:  {"Options":{"ID":"Locale","Properties":{"Decimal":".",
              "LongDate":"D. MMMM YYYY","ShortDate":"DD-MM-YYYY","Thousand":","}}}
07:53.190 T:  {"Options":{"ID":"Fonts","Properties":{"Scale":1}}}
```

Typical Web Socket Traffic




```
'F1' eWC 'Form' 'Buttons' (50 50) (200 300) ('Coord' 'Pixel')
```

➔ {"WC": {"ID":"F1",
"Properties":{"Caption":"Buttons","Coord":"Pixel",
"Posn":[0,0],"Size":[200,300],"Type":"Form"}}}

```
'F1.STATUS' eWC 'Label' 'Click on something!' (175 10) (23 300)
```

➔ {"WC":{"ID":"F1.STATUS",
"Properties":{"Caption":"Click on something!",
"Posn":[175,10],"Size":[23,300],"Type":"Label"}}}

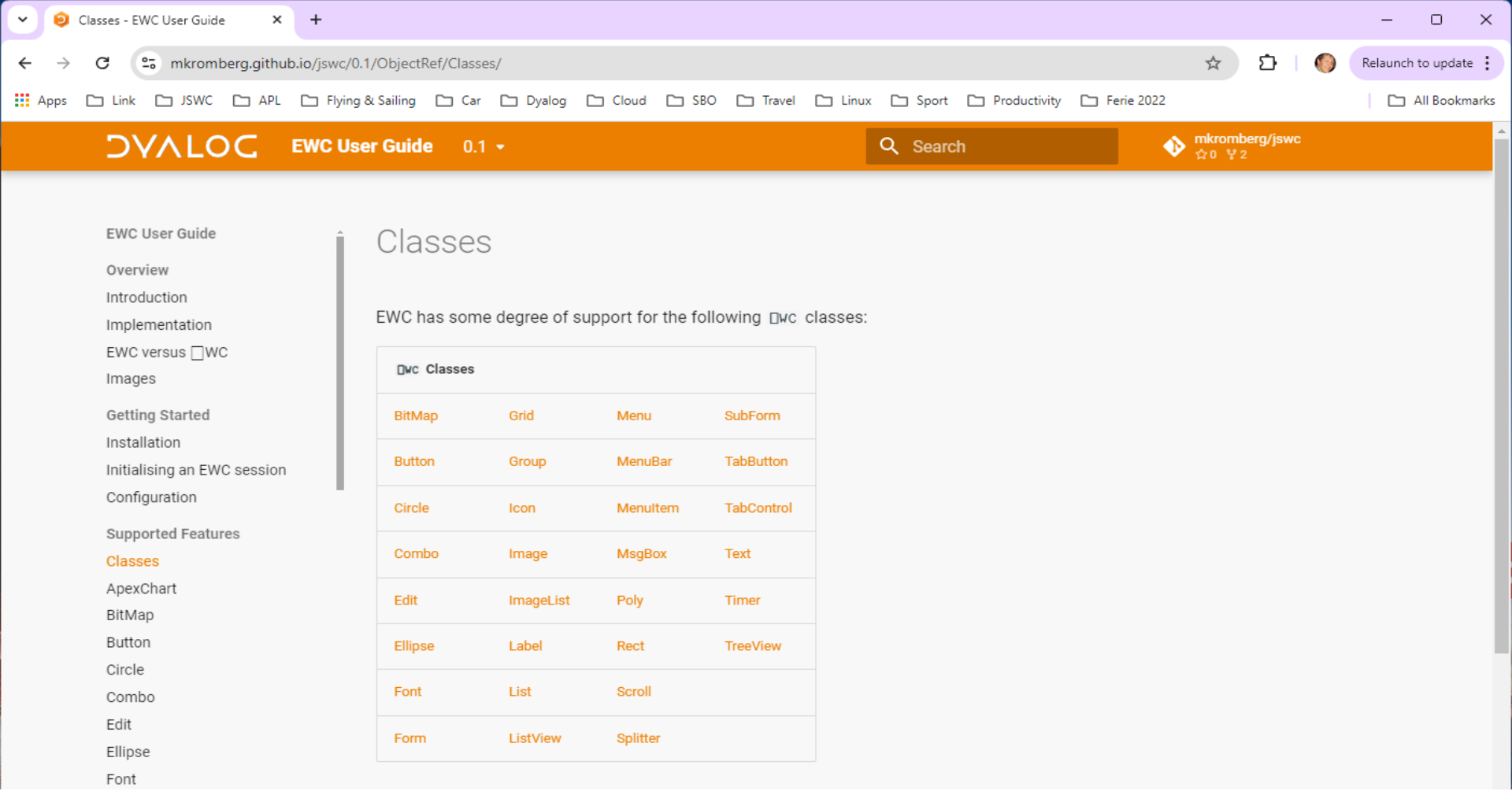
(user selects Ice Cream)

← {"Event":{"EventName":"Select","ID":"F1.ICE"}}

```
optstate←'F1.ICE' eWG 'State'
```

➔ {"WG":{"ID":"F1.ICE","Properties":["State"],"WGID":"7"}} ⍝ Ask client for state of F1.ICE

← {"WG":{"ID":"F1.ICE","Properties":{"State":1},"WGID":"7"}} ⍝ State=1


Classes - EWC User Guide
mkromberg.github.io/jswc/0.1/ObjectRef/Classes/
Relaunch to update
Apps
Link
JSWC
APL
Flying & Sailing
Car
Dyalog
Cloud
SBO
Travel
Linux
Sport
Productivity
Ferie 2022
All Bookmarks
DYALOG
EWC User Guide
0.1
Search
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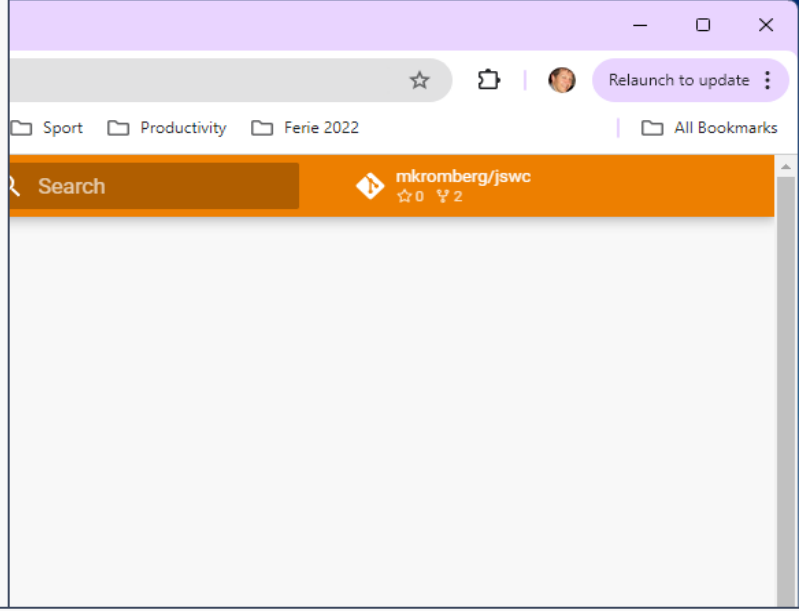
BitMap
Button
Circle
Combo
Edit
Ellipse
Font
Classes
EWC has some degree of support for the following WC classes:
WC Classes
BitMap
Button
Circle
Combo
Edit
Ellipse
Font
Form
Grid
Group
Icon
Image
ImageList
Label
List
ListView
Menu
MenuBar
MenuItem
MsgBox
Poly
Rect
Scroll
Splitter
SubForm
TabButton
TabControl
Text
Timer
TreeView

EWC has some degree of support for the following wc classes:

wc Classes			
BitMap	Grid	Menu	SubForm
Button	Group	MenuBar	TabButton
Circle	Icon	MenuItem	TabControl
Combo	Image	MsgBox	Text
Edit	ImageList	Poly	Timer
Ellipse	Label	Rect	TreeView
Font	List	Scroll	
Form	ListView	Splitter	



EWC adds the following classes not supported by wc :

Additional		
ApexChart	RibbonButton	RibbonGroup
Ribbon	RibbonButtonGroup	RibbonGroupItem

EWC User Guide
Classes
ApexChart
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Ellipse
Font
Form
Grid
Group
Icon
Image
ImageList
Label
List
ListView
Menu
MenuBar
MenuItem

Grid

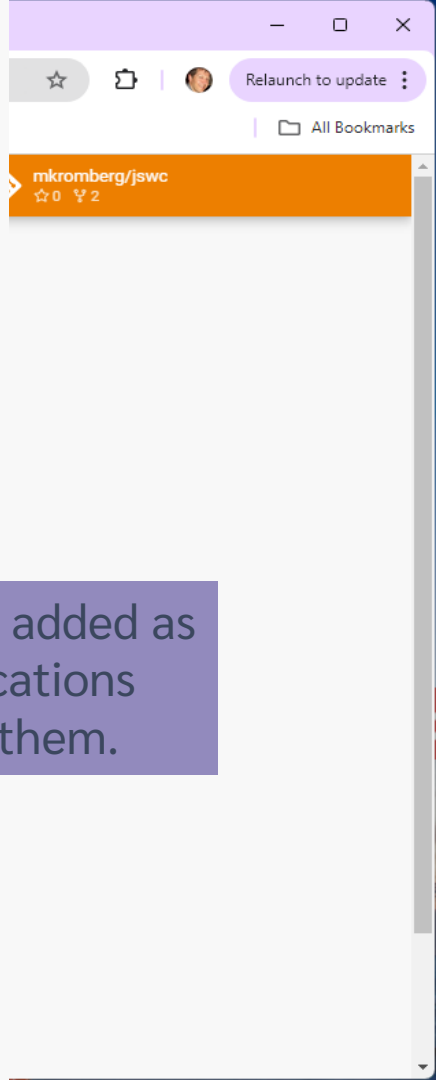
The EWC implementation of ⎕WC class Grid has some degree of support for:

Properties			
Attach	ColTitleFCol	Input	TitleHeight
BCol	ColTitles	Posn	TitleWidth
CellFonts	CurCell	RowTitleBCol	VScroll
CellHeights	Event	RowTitleFCol	Values
CellTypes	FCol	RowTitles	Visible
CellWidths	FormatString	ShowInput	
ColTitleBCol	HScroll	Size	

Events		
CellChanged	CellMove	KeyPress

The EWC implementation of `wc` class Grid has some degree of support for:

Properties			
Attach	ColTitleFCol	Input	TitleHeight
BCol	ColTitles	Posn	TitleWidth
CellFonts	CurCell	RowTitleBCol	VScroll
CellHeights	Event	RowTitleFCol	Values
CellTypes	FCol	RowTitles	Visible
CellWidths	FormatString	ShowInput	
ColTitleBCol	HScroll	Size	



Being added as applications need them.

Significant Limitations

- Limited set of Classes & Props
- Coord Pixel only
- No direct assignment and reference to properties – must use]WS /]WG
- No creation using]NEW
- Images and ImageLists are handled differently (better!)
- Validation and Error Messages weaker / different
-]NQ may not behave exactly as under Windows
- Callbacks returning new event codes is questionable

Unsupported Features

- EWC tries to "ignore" use of missing features
- Get something up and running
  - Then modify your code or ask Dyalog to add support
- If you try to create an instance of an unsupported class

```
      FOO[7] 'W0' eWC 'Widget' 'Hello World' ('Size' (300 400))
 40:32.702 W:   *** Warning: at FOO[7] - WC W0 - unsupported class "widget"
```

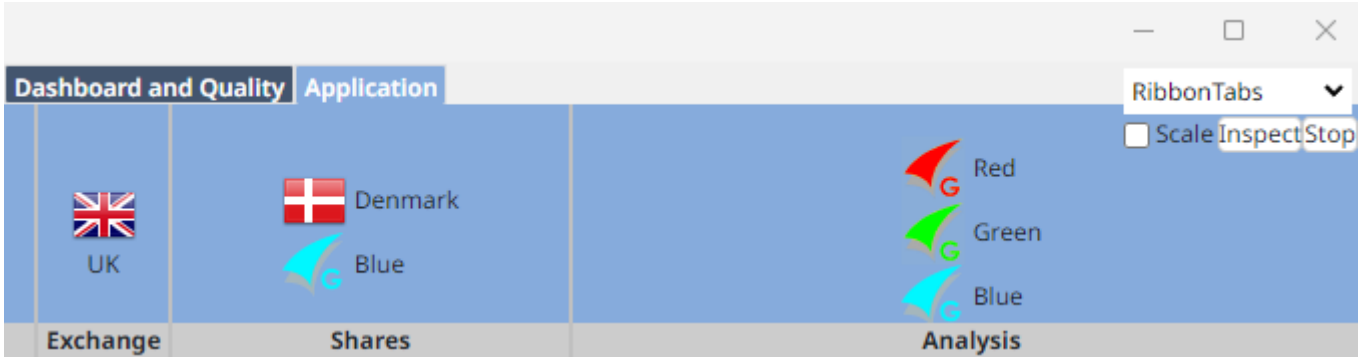
- The following still creates a form, ignoring the unsupported feature:

```
     FOO[7] 'F0' eWC 'Form' 'Hello World' ('Size' (300 400)) ('Dockable' 1)
38:58.307 W: *** Warning: at FOO[7] - Unsupported on form: Dockable
```

Extensions

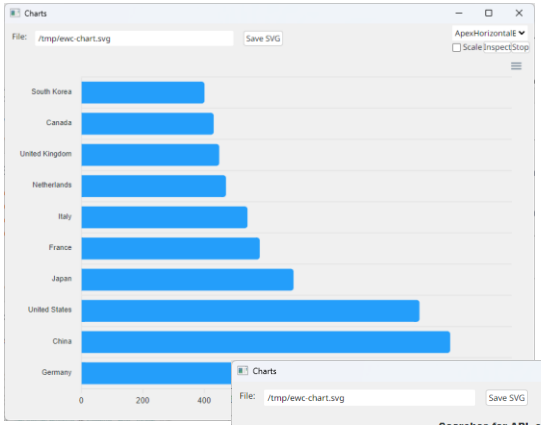
- Ribbon family of controls
- ApexCharts
- ”Flex” instead of Posn + Size
- DIY Extensions
  (KendoUI)

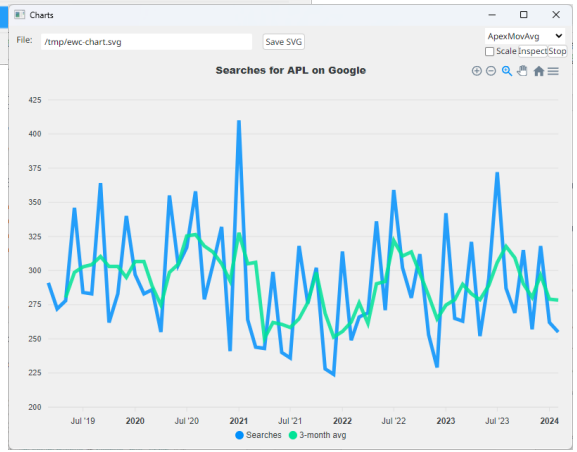
Ribbons

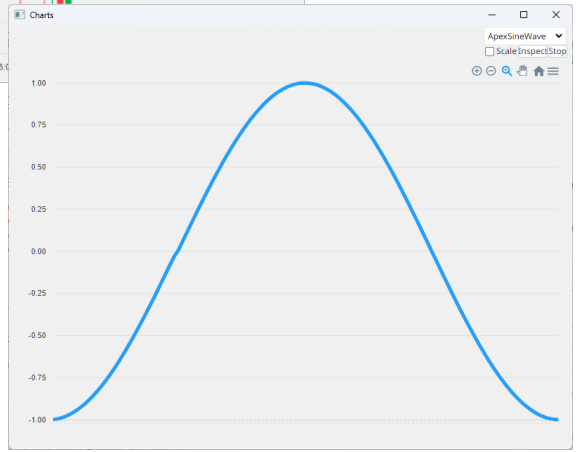



```
(rb,'.Item3')eWC'RibbonGroup' 'Exchange'('Size' 1)bordercol
(rb,'.Item3.GroupItem1')eWC'RibbonGroupItem' 12
(rb,'.Item3.GroupItem1.StockExchangeButton')eWC'RibbonButton' 'UK'('Size' 12)sel('ImageListObj' 'IL32')('ImageIndex' 2)

(rb,'.Item4')eWC'RibbonGroup' 'Shares'('Size' 3)bordercol
(rb,'.Item4.GroupItem1')eWC'RibbonGroupItem' 12
(rb,'.Item4.GroupItem1.ButtonGroup1')eWC'RibbonButtonGroup'('Denmark' 'Blue')('ImageListObj' ('IL32' 'IL'))('ImageIndex'(1 3))sel

(rb,'.Item5')eWC'RibbonGroup' 'Analysis'('Size' 6)bordercol
(rb,'.Item5.GroupItem1')eWC'RibbonGroupItem' 12
(rb,'.Item5.GroupItem1.ButtonGroup1')eWC'RibbonButtonGroup'('Red' 'Green' 'Blue')('ImageIndex'(1 2 3))sel

eNQ'F1.TC.T1' 'Select'
```

ApexCharts – Four Demos







Everywhere WC

DYALOG

ApexCharts Design

- `Options` are passed straight through
  (JSON string or APL namespace)
- `Series` can be in several APL-friendly formats:

```
series←400 430 448 470 540 580 690 1100 1200 1380
```

```
cd←demodata.candledata
time←1 12 ⎕DT (1 ⎕DT⊂4↑⎕TS)++\0,(¯1+≢cd)⍴÷96 ⍝ Every 15 minutes from last hour
series←(↓cd) time ⍝ (Matrix of Open High Low Close values) (X values)
```

```
series←(data 'Searches' months) (smoothed '3-month avg' ((window-1)↓months))
⍝ Triplets of (yvalues name xvalues)
```

ApexCharts SVG Property

- The SVG property allows us to retrieve the SVG for the chart
- Use ApexCharts in an invisible HTMLRenderer to generate charts

```
      ≠svg←'F1.BAR' eWG 'SVG'
29820

      4 80⍴svg
<svg id="SvgjsSvg1006" width="780" height="540" xmlns="http://www.w3.org/2000/
g" version="1.1" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:svgjs="http:
svgjs.dev" class="apexcharts-svg" xmlns:data="ApexChartsNS" transform="transla
(0, 0)" style="background: transparent;"><foreignObject x="0" y="0" width="780
```

Extending EWC

```
import ReactApexChart from 'react-apexcharts';
import { useAppData } from '../../hooks';
import { setStyle } from '../../utils';
import { useEffect, useRef } from 'react';

const Chart = ({ data }) => {
  const { Options, Posn, Series, Size, ChartType, Event } = data?.Properties;

  const { socket, handleData } = useAppData();
  const styles = setStyle(data?.Properties);

  const chartRef = useRef(null);

  useEffect(() => {
    if (chartRef.current) {
      setTimeout(() => {
        const chartInstance = chartRef.current.chart.paper();
        const svg = chartInstance.svg();
        if (svg) {
          localStorage.setItem(data.ID, JSON.stringify(svg));
          handleData(
            {
              ID: data?.ID,
              Properties: {
                SVG: svg,
              },
            },
            'WS'
          );
        }
      }, 500);
    }
  }, [chartRef.current]);

  const sendEvent = (event, chartConfig) => {
    const obj = {
      dataPointIndex: chartConfig?.dataPointIndex,
      seriesIndex: chartConfig?.seriesIndex,
      series: chartConfig?.config?.series,
      xaxis: chartConfig?.config?.xaxis,
      yaxis: chartConfig?.config?.yaxis,
    };

    const Event = JSON.stringify({
      Event: {
        ID: data?.ID,
        EventName: event,
        Info: [JSON.stringify(obj)],
      },
    });
    socket.send(Event);
  };

  const options = {
    ...Options,
    chart: {
      events: {
        ...(Event?.some((item) => item[0] === 'click') && {
          click: (chartConfig) =>
            sendEvent('click', chartConfig),
        }),
        ...(Event?.some((item) => item[0] === 'legendclick') && {
          legendClick: (chartConfig) =>
            sendEvent('legendclick', chartConfig),
        }),
      },
    },
  };

  return (
    <div style={{ position: 'absolute', top: Posn && Posn[0], left: Posn && Posn[1], ...styles }}>
      <ReactApexChart
        ref={chartRef}
        options={options}
        width={Size && Size[1]}
        height={Size && Size[0]}
        type={ChartType}
        series={Series}
      />
    </div>
  );
};

export default Chart;
```


Everywhere W

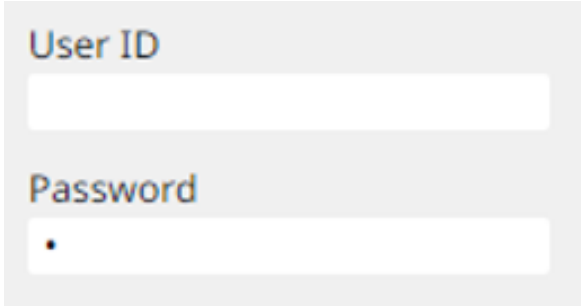
Flex – Instead of Posn & Size

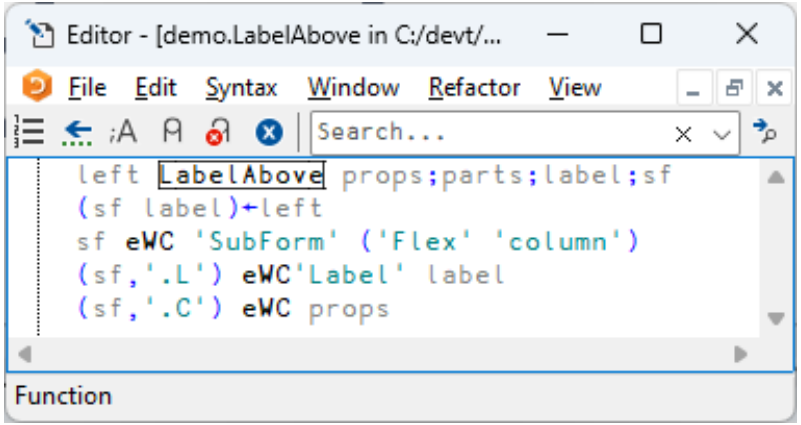
- Still VERY experimental – Feedback Please!
- The Flex property can be set on containers
  - `'Flex' 'fill'`
    Form should fill the available space (Forms only)
  - `'Flex' 'row'`
    Stack controls horizontally (Any container object)
  - `'Flex' 'column'`
    No comment
- By default, `'fill'` sets column orientation
- CSS property allows you to add additional CSS styling

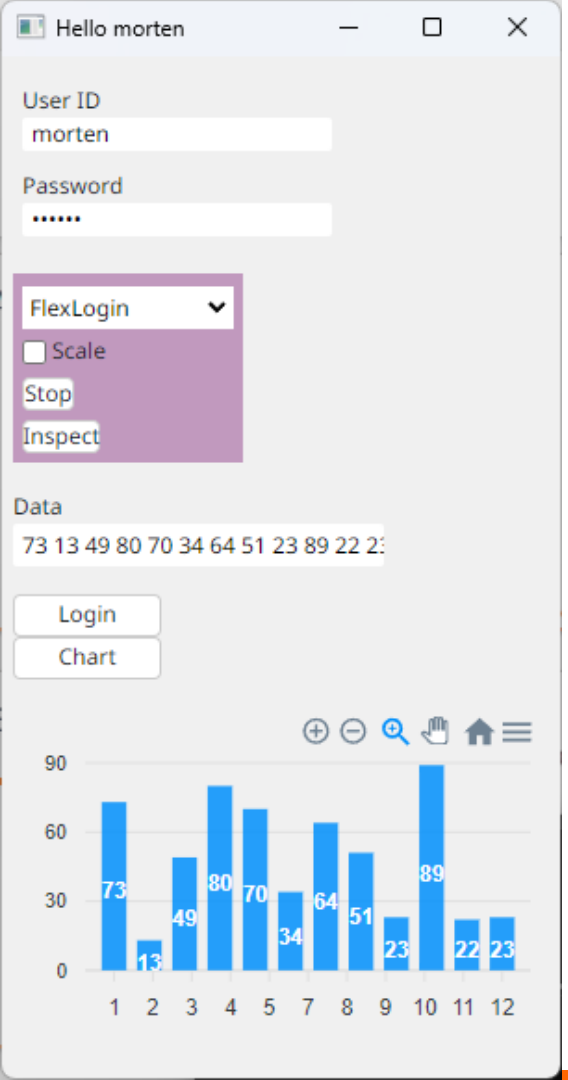
SubForm = "StackPanel"

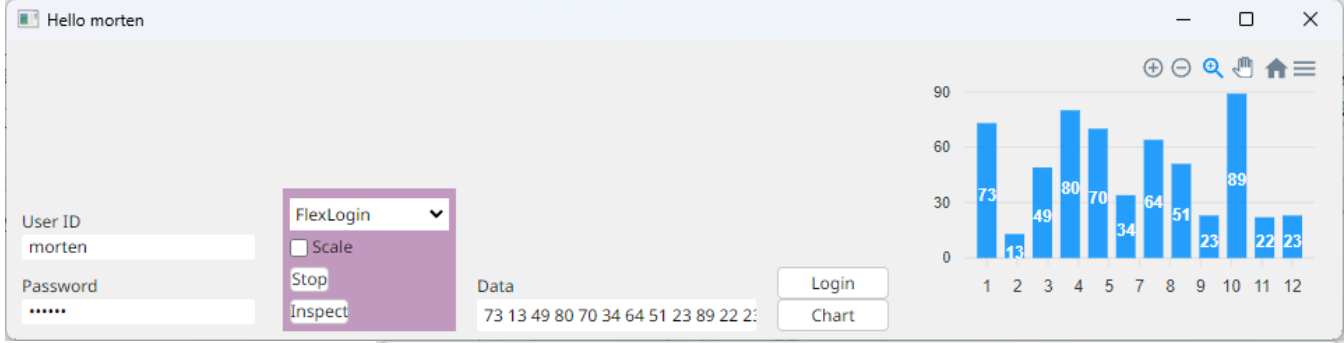
- A Subform with Flex becomes a "StackPanel"

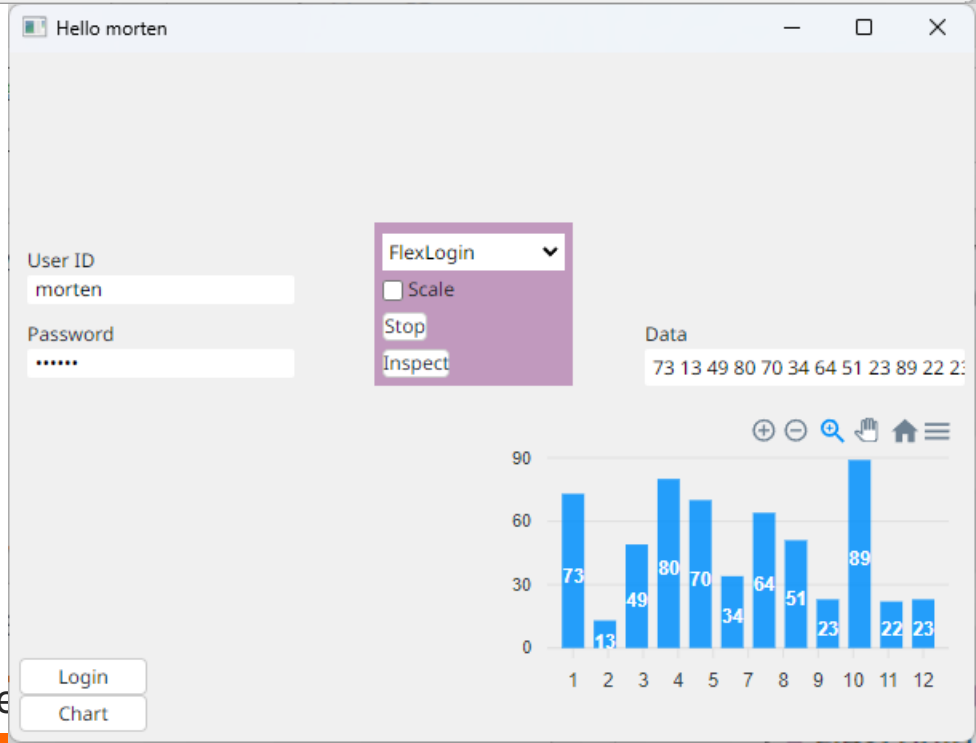
```
'F1.INPUT.CREDS' eWC 'SubForm' ('Flex' 'column')
'F1.INPUT.CREDS.USERID' 'User ID'  LabelAbove 'Edit' ''
'F1.INPUT.CREDS.PWD'    'Password' LabelAbove 'Edit' '' ('Password' '*')
```






Hello morten
User ID
morten
Password
••••••
FlexLogin
Scale
Stop
Inspect
Data
73 13 49 80 70 34 64 51 23 89 22 23
Login
Chart
90
60
30
0
73
13
49
80
70
34
64
51
23
89
22
23
1 2 3 4 5 7 8 9 10 11 12


Hello morten
User ID
morten
Password
••••••
FlexLogin
Scale
Stop
Inspect
Data
73 13 49 80 70 34 64 51 23 89 22 23
Login
Chart
90
60
30
0
73
13
49
80
70
34
64
51
23
89
22
23
1 2 3 4 5 7 8 9 10 11 12


Hello morten
User ID
morten
Password
••••••
FlexLogin
Scale
Stop
Inspect
Data
73 13 49 80 70 34 64 51 23 89 22 23
Login
Chart
90
60
30
0
73
13
49
80
70
34
64
51
23
89
22
23
1 2 3 4 5 7 8 9 10 11 12

Everywhere

Multi User Mode

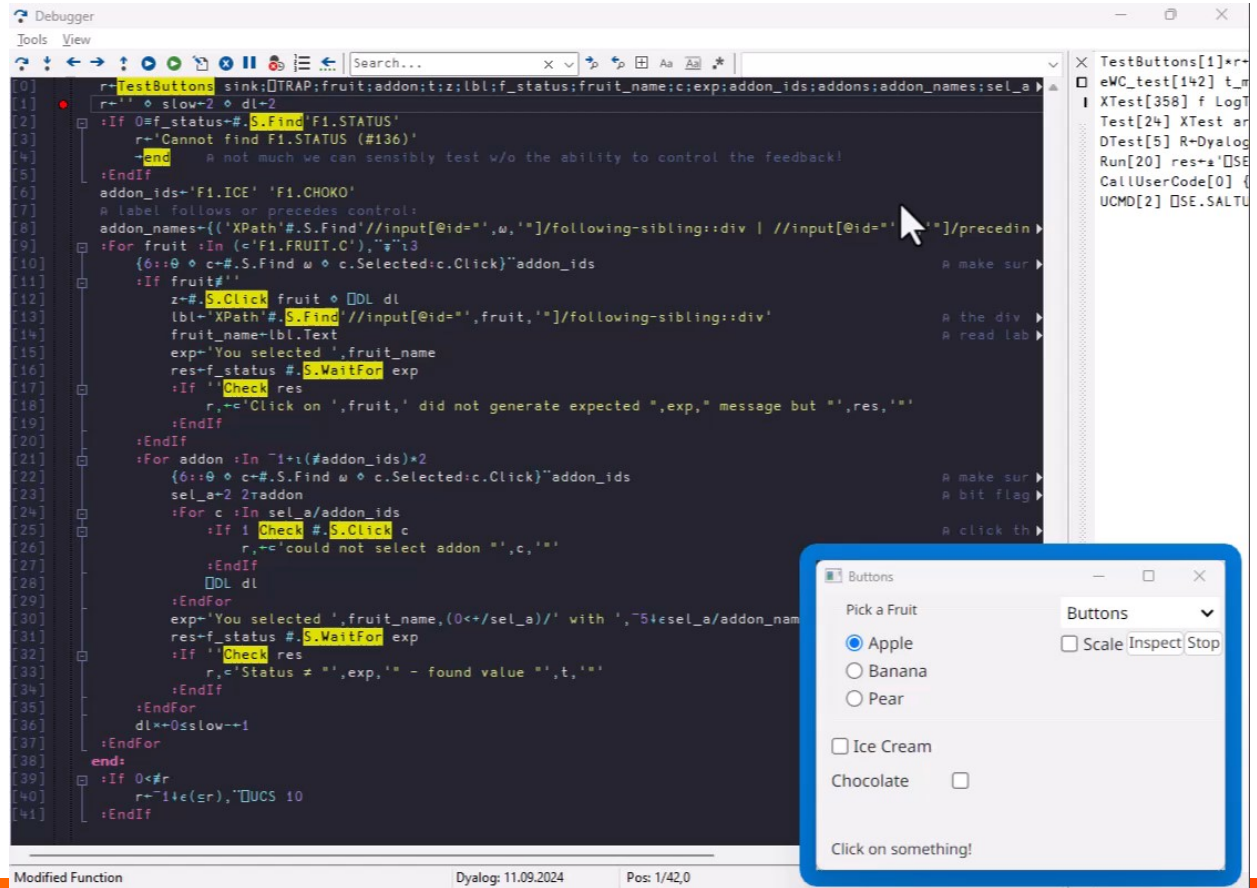
Intended for multi-user applications.

```
EWC.Init 'Multi'
```

- Must be called from a namespace which contains a function names `Initialise`
- Initialise MUST create and `eDQ` a Form (and `demo.Run` will do this)
- This namespace will be cloned for each new Browser connection, and `Initialise` will be called on a new thread
- Notice each user is suspended in `⍙DQ` in a namespace named `demo_n`.

```
      demo.Run 'Multi'
(lots of output as two sessions connect)

      )si
·   ·   #.EWC.⍙DQ[42]
·   ·   #.demo_1.Initialise[13]
·   &5
·   ·   #.EWC.⍙DQ[42]
·   ·   #.demo_2.Initialise[13]
·   &6
·   [#.EWC.[LIB]] #.EWC.Conga.LIB.Wait[8]
·   [#.EWC.[wss]] #.EWC.wss.Listen[2]
·   #.EWC.wss.Start[14]
&4
```

Selenium Testing



DYALOG

Current Status

Supported subset has been driven by the needs of two launch customers

- One converting a mature asset management system which needs to move off the Windows desktop
- One building new web components in APL to enhance an existing C#/JS based web app

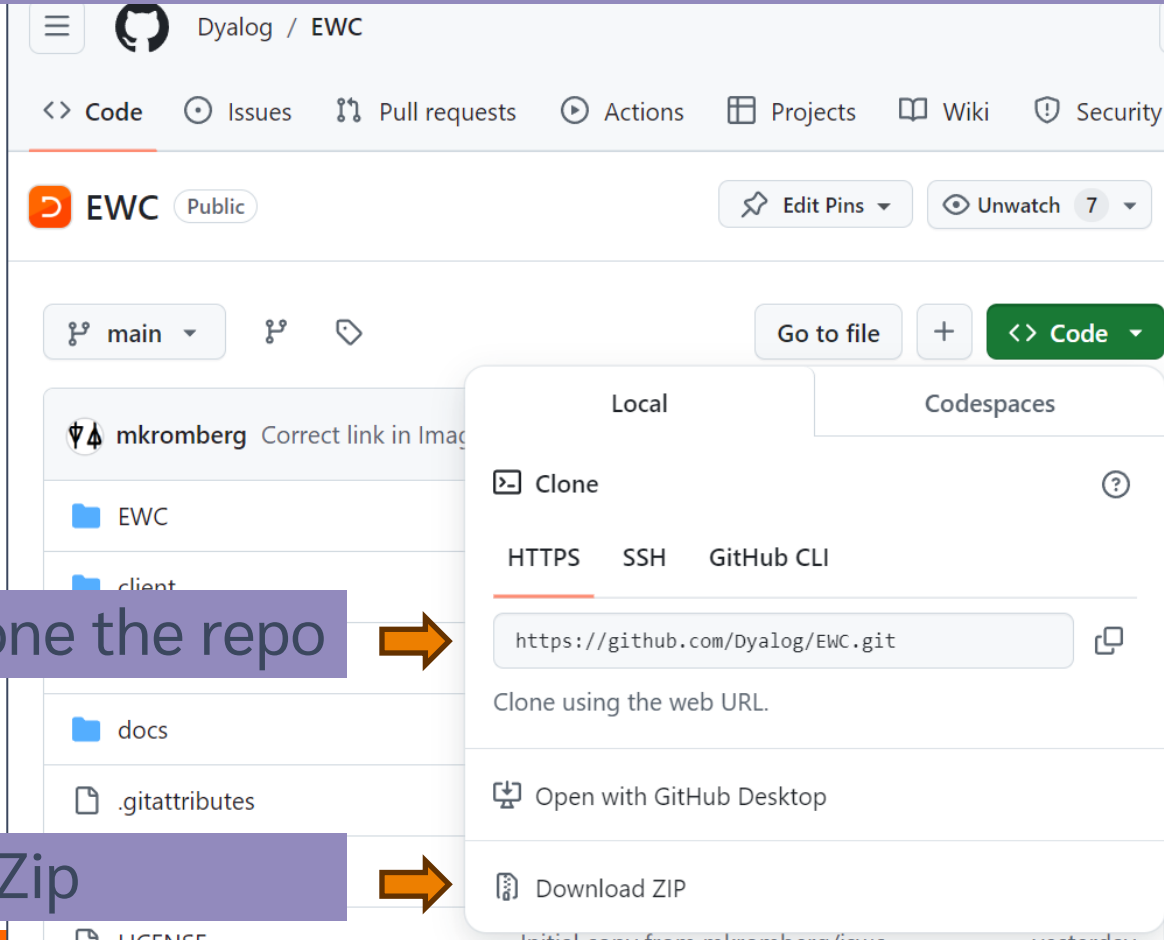
Both of these should be up & running very soon

EWC Status, Continued

- Worked on prototype for 12+ months with an external contractor
- Now Augmented with a full-time JavaScript developer
- Free and Open Source
  - We will document how to create your own extensions
- We expect to add features quickly this winter
  - Send us sample apps / tell us what you need!

https://github.com/dyalog/ewc

To play...



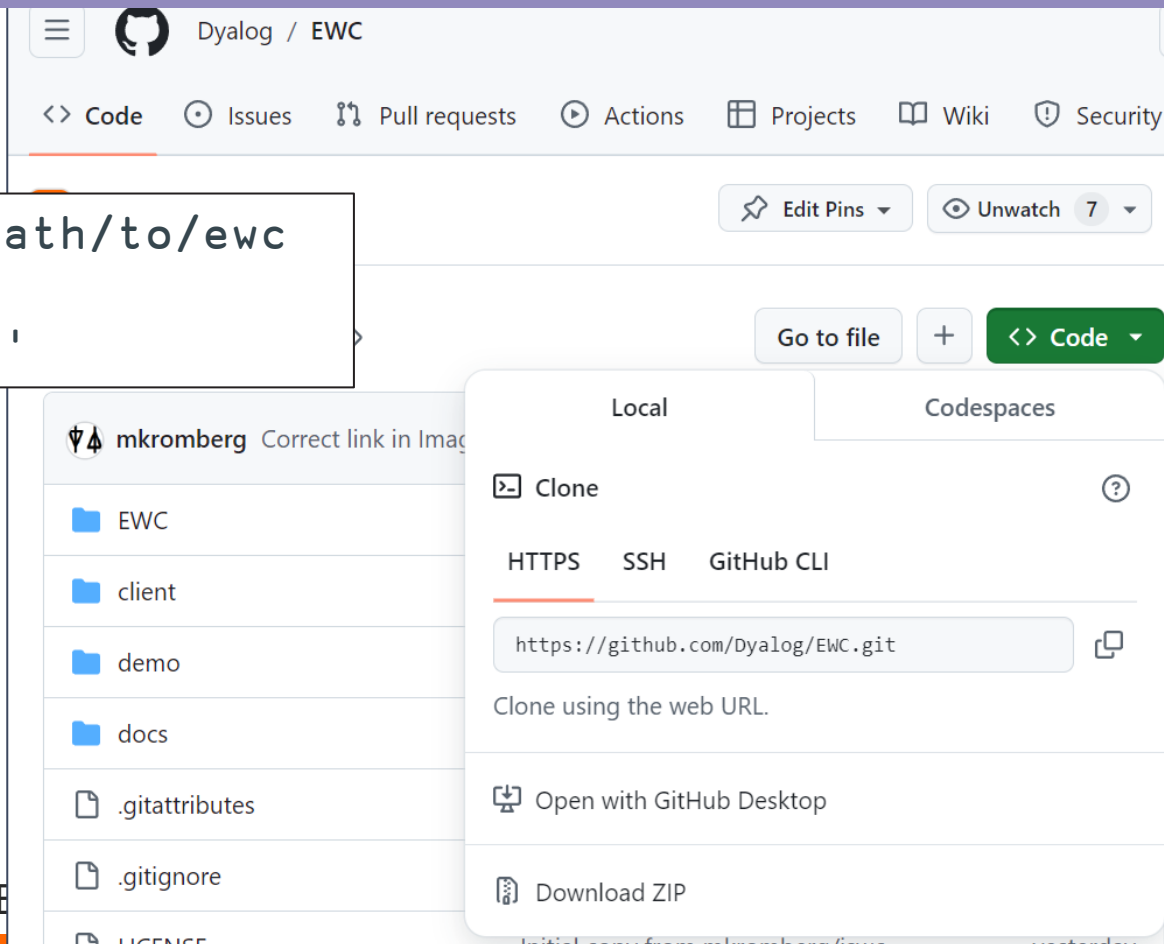
Clone the repo

OR

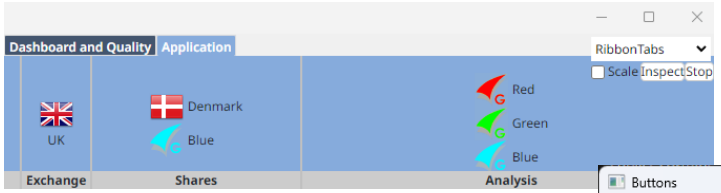
UnZip

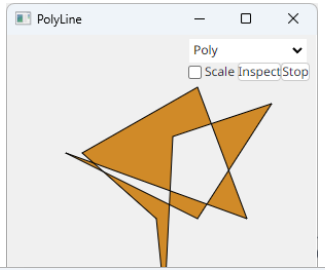
https://github.com/dyalog/ewc

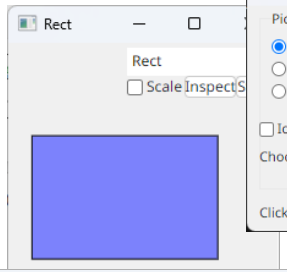
```
]link.create # /path/to/ewc

demo.Run 'Desktop'
```

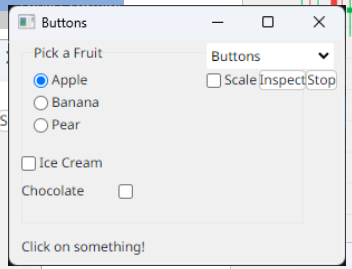


Thank You!

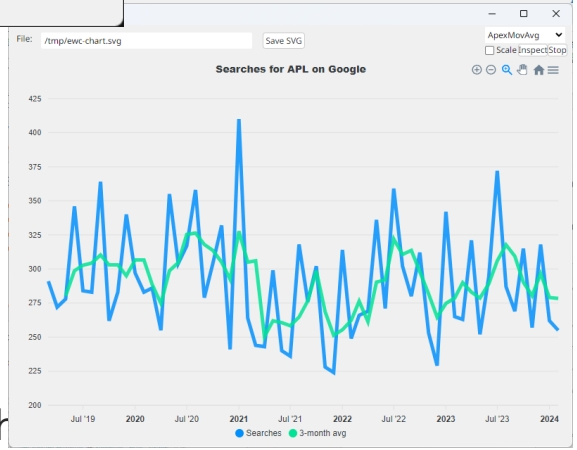

Dashboard and Quality
Application
RibbonTabs
Scale
Inspect
Stop
UK
Denmark
Blue
Red
Green
Blue
Exchange
Shares
Analysis

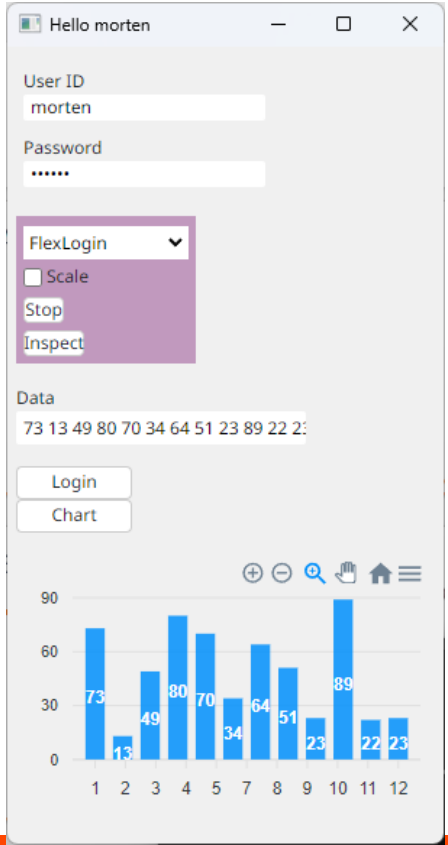

PolyLine
Poly
Scale
Inspect
Stop


Rect
Rect
Scale
Inspect


Buttons
Pick a Fruit
Apple
Banana
Pear
Buttons
Scale
Inspect
Stop
Ice Cream
Chocolate
Click on something!

Charts
File:
/tmp/ewc-chart.svg
Save SVG
ApexCandleStick
Scale
Inspect
Stop
CandleStick Chart
6660.00
6650.00
6640.00
6630.00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00


File:
/tmp/ewc-chart.svg
Save SVG
ApexMovAvg
Scale
Inspect
Stop
Searches for APL on Google
425
400
375
350
325
300
275
250
225
200
Jul '19
2020
Jul '20
2021
Jul '21
2022
Jul '22
2023
Jul '23
2024
Searches
3-month avg


Hello morten
User ID
morten
Password
FlexLogin
Scale
Stop
Inspect
Data
73 13 49 80 70 34 64 51 23 89 22 2
Login
Chart
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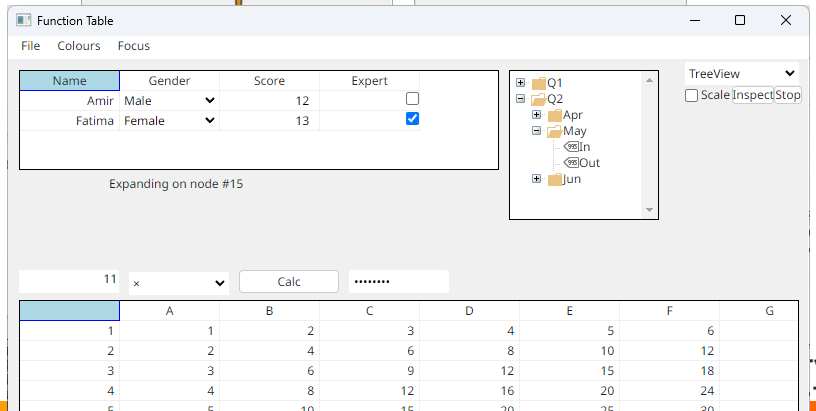
12


Function Table
File
Colours
Focus
Name
Gender
Score
Expert
Amir
Male
12
Fatima
Female
13
Expanding on node #15
Q1
Q2
Apr
May
In
Out
Jun
TreeView
Scale
Inspect
Stop
11
Calc
A
B
C
D
E
F
G
1 1 2 3 4 5 6
2 2 4 6 8 10 12
3 3 6 9 12 15 18
4 4 8 12 16 20 24