

Two Informix Tech Talks for 4GL Developers by Reuben Barclay

Date: Thursday, July 21, 2022, 2:00pm EST

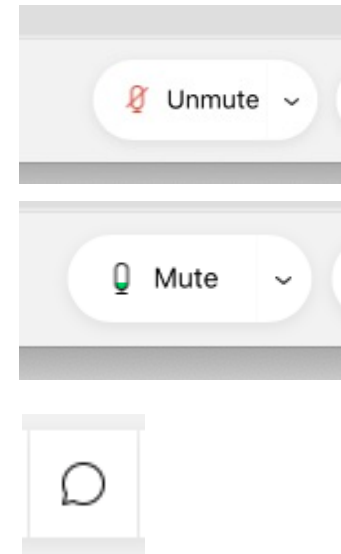
- Transforming Your System From Informix-4gl to Genero - The Many Options and First Steps.
- Wordle 4 Genero

Please register - <https://www.iug.org/en/services/next-webcast/>



Webcast Guidelines

- **The Webcast is pre-recorded.**
The replay and slides will be available on the IIUG Website
- **Please Mute your line.**
Background sounds will distract everyone
- **Use the Chat Button** to ask questions



who am i

➤ Reuben Barclay

- reuben.barclay@4js.com

➤ Four Js

- <https://www.4js.com>

➤ Auckland, New Zealand

➤ Two roles at Four Js

- Technical Consultant Asia Pacific Region
 - Australia, New Zealand, Malaysia, Taiwan
- Developer Relations Manager
 - WWDC (<https://4js.com/wwdc/>)
 - Forums (https://forum.4js.com/fjs_forum/)
 - Ask-Reuben (<https://4js.com/ask-reuben/>)
 - Early Access Programs – Feature of the Day
 - etc



My Story

➤ 1997-1999 - First Exposed Informix-4gl

- Developer @ Quanta Systems Ltd, Auckland, NZ
- Kerry Sainsbury was our R&D. Kerry was on IIUG board so that name may be familiar to a few

➤ 1999-2001 – Time in London, UK

- Developer / System Administration @ Fuller Smith & Turner, London, UK

➤ 2002-2008 – Back to New Zealand

- R&D at Quanta Systems Ltd
- Transformed our Informix-4gl application to Genero

➤ 2008–present – Consultant @ Four Js

- Helping transformations to Genero
- Improving the use of Genero



Four Js Story

➤ Four Js Development Tools

- <https://4js.com/>
- Founded 1992
 - <https://4js.com/2012-it-was-twenty-years-ago-today/>
- Products
 - Universal Compiler, Business Development Systems (BDS)
 - 1990's, early 2000's
 - Genero
 - From 2003
- Read more at
 - <https://4js.com/files/documents/company/Genero-21st-Century-4GL-WhitePaper.pdf>
 - <https://4js.com/files/documents/company/Four-Js-sales-brochure.pdf>
 - <https://4js.com/files/documents/company/Genero-sales-brochure.pdf>



Four Js Story

➤ Four Js Development Tools

- Partnerships with IBM including at one stage, an OEM arrangement “IBM Informix Genero”
- Acquired by Volaris Group September 2021
 - <https://explore.volarisgroup.com/press-room/volaris-enters-software-development-vertical-with-acquisition-of-four-js>
 - <https://www.volarisgroup.com/>
 - Volaris Group part of Constellation Software
 - <http://www.csisoftware.com/>
- Partnership with HCL January 2022
 - <https://blog.hcltechsw.com/onedb/hcl-software-enters-business-partnership-with-four-js-development-tools-to-modernize-applications-in-the-database-market/>



Transforming Your System From Informix-4gl to Genero - The Many Options and First Steps by Reuben Barclay

Informix Tech Talks by the IIUG



Introduction – Transform Your System

➤ *Transforming Your System From Informix-4gl to Genero*

➤ **Definition of *Transform***

- To change into another form without altering the value
- To change in appearance of character
- To change greatly the appearance or form of



Introduction – Many First Steps

➤ Many Options and First Steps

- GUI IDE – Genero Studio
- Report – Genero Report Writer
- Web Services – Genero Web Services
- Database – ODI Layer
- New Syntax -
- Testing – Genero Ghost Client
- GUI, Web, Mobile – Genero Browser Client, Genero Mobile
- More ...



Q: How long is a Genero transformation?



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Genero Transformation - Inputs

➤ Variability of Inputs

- Number of lines of code ?
- Number of .4gl, .per files
- Quality of Code, Code Standards
- Code generator, pre-processor usage, generic code
- Testing Facilities and Resources / Daily Builds / Smoke Tests



Genero Transformation - Outputs

➤ Variability of Outputs

- What are we transforming ?
 - GUI Screens
 - Reports
 - Development Environment
 - Are we changing the User Experience ?
 - Multi-Dialog
 - Are we taking the opportunity to make other changes ?
- What Quality ?
 - Enterprise versus ISV
- Deadlines ?
 - ISV Release Date, Enterprise can be gradual



First Step: Compile and Run Your Existing Application



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First Step - Compiling

➤ Your development environment

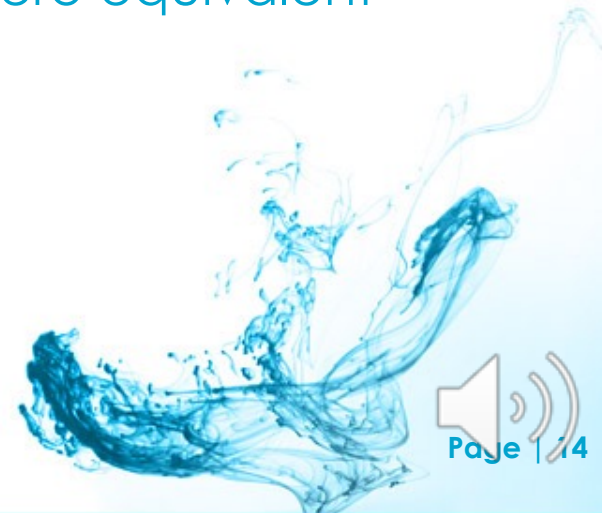
- Replace Informix-4gl commands with Genero equivalents
 - fglpc -> fglcomp
 - fglgo -> fglrun
 - Etc.
- Set environment variables in your environment
 - \$FGLDIR/bin to PATH etc.

➤ Review c code

- Shared library
- Often can replace c function with Genero equivalent

➤ Review database connection code

➤ Review database schema concept



First Step - Compiling

- You can run your existing system using the Four Js Genero compiler and runner in your existing environment
- This is what we call TUI mode.
 - FGLGUI=0
- For some customers, this is enough!

```
File Edit View Search Terminal Help

Customer form

Name: [Charles Volfberg           ] Id:[ 342]
Phone: [823 23 243 22           ]
Address: [5, Sunset St.         ]
          [                       ]
City:    [Gartenstoll           ]
Zipcode: [ZW34                  ] State: [Nillinois ]

Enter customer information
```



Second Step: Evaluate and Improve



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Release History

- Genero is continuously developed
- Mock Wikipedia page ...
 - Windows, Java version etc. show the version available at that time

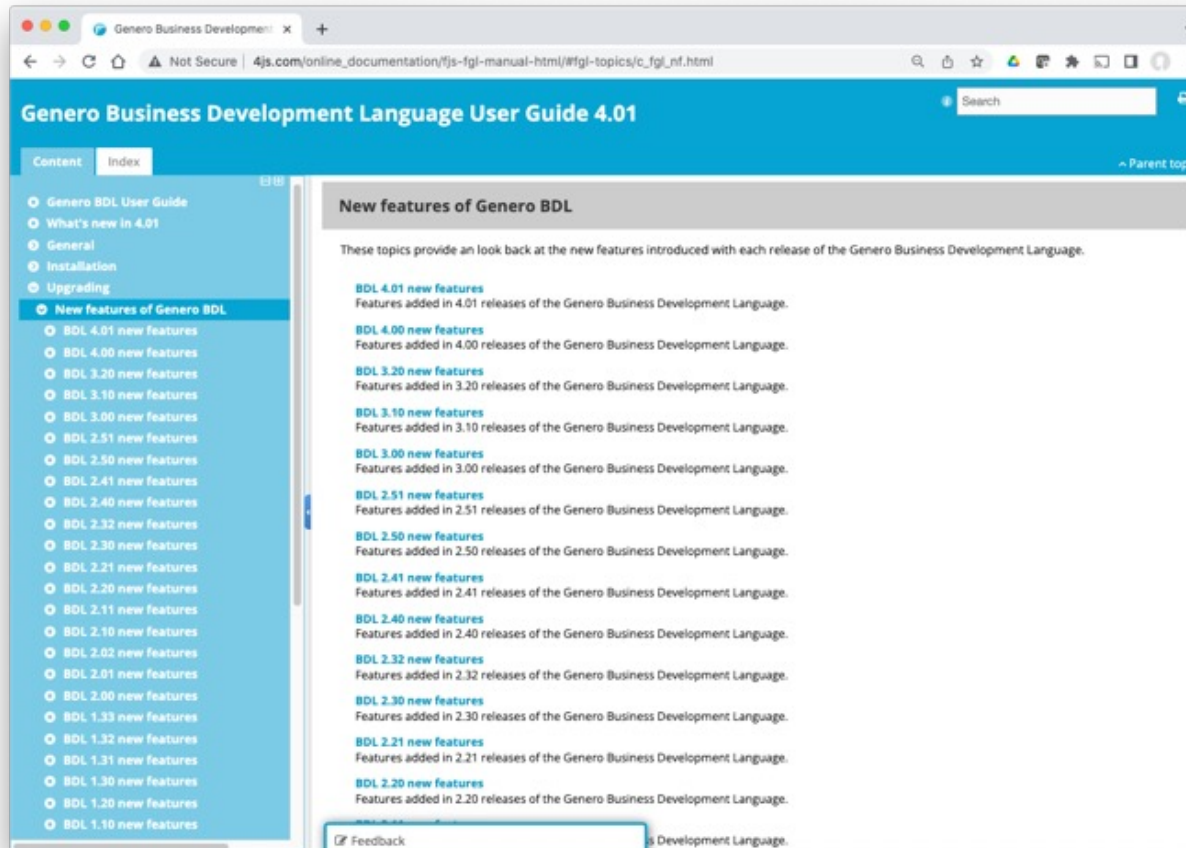
Genero Version	Release Date	Windows Version	iPhone Version	Java Version	Android Version	RedHat Version	End of Support
1.20	Sep 2003	XP		J2SE 1.4		2.1	Apr 2009
1.30	May 2004	XP		J2SE 5.0		3	Oct 2010
2.00	Oct 2006	XP		Java SE6		4	Jan 2012
2.10	Nov 2007	Vista	iPhone 1	Java SE6		5	Nov 2013
2.20	Apr 2009	Vista	iPhone 3	Java SE6	Cupcake (1.5)	5	Dec 2015
2.30	Oct 2010	Windows 7	iPhone 4	Java SE6	Froyo (2.2)	5	Sep 2017
2.40	Jan 2012	Windows 7	iPhone 4S	Java SE7	Ice Cream Sandwich (4.0)	6	Jun 2019
2.50	Nov 2013	Windows 8.1	iPhone 5S	Java SE7	KitKat (4.4)	6	Dec 2019 ★
3.00	Dec 2015	Windows 10	iPhone 6S Plus	Java SE8	Marshmallow (6.0)	7	Sep 2021
3.10	Sep 2017	Windows 10	iPhone 7 Plus	Java SE9	Oreo (8.0)	7	vNext
3.20	Jun 2019	Windows 10	iPhone XS/XR	Java SE12	Pie (9.0)	8	vNext + 1
4.00	Sep 2021	Windows 11★	iPhone 13	Java SE17	12★★	8	vNext+2
vNext	??? 2023	?	?	?	?	?	vNext + 3
vNext + 1	??? 2025	?	?	?	?	?	vNext + 4
vNext + 2	??? 2027	?	?	?	?	?	vNext + 5



Documentation – New Features

➤ Review New Features in our documentation

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_nf.html



The screenshot shows a web browser window displaying the 'Genero Business Development Language User Guide 4.01'. The page has a blue header with a search bar and a navigation menu on the left. The main content area is titled 'New features of Genero BDL' and contains a list of links for each release version, from 4.01 down to 1.10. The browser's address bar shows the URL: http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_nf.html. The page title is 'Genero Business Development Language User Guide 4.01'. The navigation menu on the left includes 'Content', 'Index', and a list of topics such as 'Genero BDL User Guide', 'What's new in 4.01', 'General', 'Installation', 'Upgrading', and 'New features of Genero BDL'. The 'New features of Genero BDL' section is currently selected and highlighted in blue. The main content area lists the following links:

- [BDL 4.01 new features](#): Features added in 4.01 releases of the Genero Business Development Language.
- [BDL 4.00 new features](#): Features added in 4.00 releases of the Genero Business Development Language.
- [BDL 3.20 new features](#): Features added in 3.20 releases of the Genero Business Development Language.
- [BDL 3.10 new features](#): Features added in 3.10 releases of the Genero Business Development Language.
- [BDL 3.00 new features](#): Features added in 3.00 releases of the Genero Business Development Language.
- [BDL 2.51 new features](#): Features added in 2.51 releases of the Genero Business Development Language.
- [BDL 2.50 new features](#): Features added in 2.50 releases of the Genero Business Development Language.
- [BDL 2.41 new features](#): Features added in 2.41 releases of the Genero Business Development Language.
- [BDL 2.40 new features](#): Features added in 2.40 releases of the Genero Business Development Language.
- [BDL 2.32 new features](#): Features added in 2.32 releases of the Genero Business Development Language.
- [BDL 2.30 new features](#): Features added in 2.30 releases of the Genero Business Development Language.
- [BDL 2.21 new features](#): Features added in 2.21 releases of the Genero Business Development Language.
- [BDL 2.20 new features](#): Features added in 2.20 releases of the Genero Business Development Language.



Documentation – New Features

➤ Each product has its own documentation

- <https://4js.com/download/documentation/>

The screenshot shows the 4js.com website with the following content:

- Navigation Menu:** Home, Company, Customers, Products, Services, Download, Support, Training, News, Contact.
- Page Title:** Genero Enterprise 4.01
- Table of Documentation:**

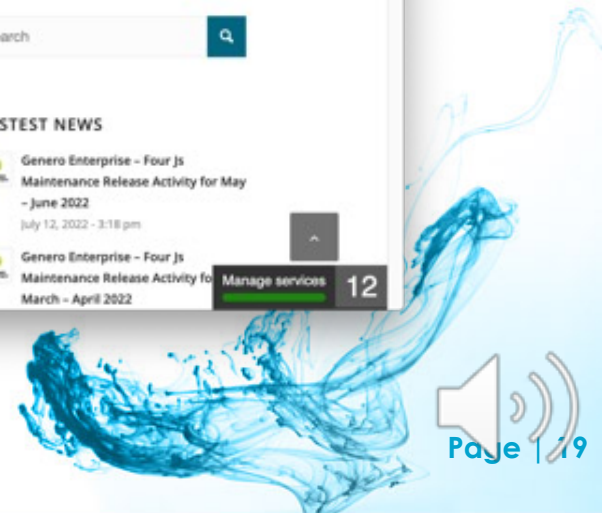
	Online HTML	Zipped HTML	PDF	Zipped PDF
Supported platforms and databases			372 KB	
Install and license your Genero products				
4.01.02 - Installation Guide	ONLINE	20.6 MB	1.85 MB	1.58 MB
Genero Tutorial				
4.01.02 - Tutorial	ONLINE	2.76 MB	1.74 MB	1.58 MB
Genero Studio (GST)				
4.01.02 - User Guide	ONLINE	42.34 MB		
Genero Business Development Language (BDL)				
4.01.02 - User Guide	ONLINE	25.42 MB	21.39 MB	14.97 MB
Genero Desktop Client (GDC)				
4.01.02 - User Guide	ONLINE	3.32 MB	2.4 MB	2.2 MB
Genero Application Server (GAS)				
4.01.02 - User Guide	ONLINE	8.24 MB	7 MB	6 MB
Genero Browser Client (GBC)				
4.01.02 - User Guide	ONLINE	3.42 MB	2.37 MB	1.79 MB
Genero Ghost Client (GGC)				
4.01.02 - User Guide	ONLINE	1.97 MB	982 KB	697 KB

SERVICE LEVEL AGREEMENT

- Technical Support and Maintenance terms and conditions for Genero
- Technical Support and Maintenance terms and conditions for BDS
- Genero and Genero Mobile Software License Agreement
- End User License Agreements

LASTEST NEWS

- Genero Enterprise - Four Js Maintenance Release Activity for May - June 2022
July 12, 2022 - 3:18 pm
- Genero Enterprise - Four Js Maintenance Release Activity for March - April 2022



Code Improvements



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Code Improvement - Performance

➤ Anytime you see ...

```
DEFINE var CHAR(1000)  
DEFINE arr ARRAY[1000] ...
```

➤ Consider using **STRING** and **DYNAMIC ARRAY**

```
DEFINE var STRING  
DEFINE arr DYNAMIC ARRAY ...
```

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_datatypes_STRING.html
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_Arrays_010.html

➤ Advantages

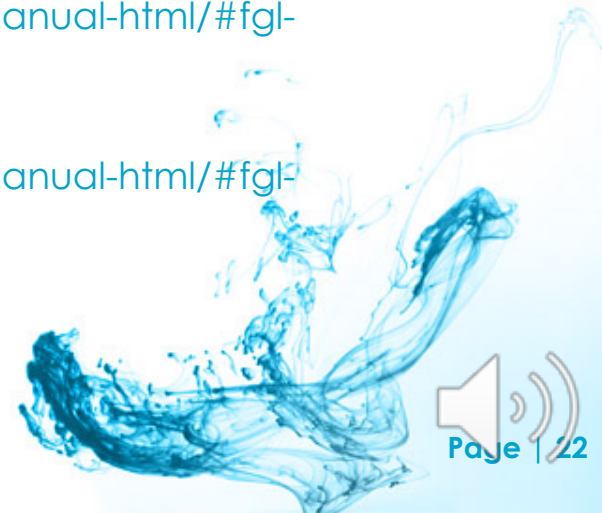
- Less memory consumption
- Remove code to cater for arbitrary maximum
- Remove chance of error when maximum exceeded
- Methods available e.g.
 - `s.getLength()`, `arr.getLength()`



Code Improvement - Performance

➤ Speed

- Pass By Reference
- INOUT
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_runtime_stack_params_record.html
- stringBuffer
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_ClassStringBuffer.html
- Built-in methods
 - array.sort()
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_Arrays_ARRAY_sort.html
 - array.search()
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_Arrays_ARRAY_search.html



Code Improvement - Maintainability

➤ Syntax enhancements that mean coding errors are more likely to be caught at compile time and not runtime. Consider implementing the following...

- Replacing GLOBALS with IMPORT FGL

 - <https://4js.com/ask-reuben/ig-13/>

- Making use of TYPE to ensure what is passed to a function is what the function is expecting

```
TYPE coordinateType RECORD
    latitude, longitude DECIMAL(8,5)
END RECORD
```

 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_user_types_003.html

- Making use of RETURNS to ensure that what is returned from a function is expected

```
FUNCTION add(a INTEGER, b INTEGER) RETURNS INTEGER
```

 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_Functions_returns.html



Code Improvement - Compression

➤ Syntax enhancements to use less lines of code

- DEFINE initializer

```
DEFINE x INTEGER = 0
```

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_variables_009.html

- IIF()

```
LET drcr = IIF( value>0, "DR", "CR")
```

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_operators_IMMEDIATE_IF.html

- Assignment Operator (:=)

```
LET arr[idx:=idx+1] = value
```

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_operators_ASSIGNMENT.html

- Method chaining

```
CALL ui.Window.getCurrent().setText("Foo")
```

- Inline Function parameter

```
FUNCTION foo(bar INT)
```

- Slacken rules about where DEFINE is located



Code Improvement – Modern Syntax

➤ Syntax enhancements that a developer is likely to have seen in other languages

- CONSTANT
- TYPE
- TRY/CATCH
- +=
- PUBLIC / PRIVATE
- Package/Class/Method
 - Dot Notation
 - Something like the following is familiar to developers from other languages
 - `IF array.getLength() > 0 THEN`



Code Improvement – Library

➤ Many Libraries added to Genero runtime including ...

- base.Channel – working with files, pipes, sockets
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_ClassChannel.html
- os.Path – working with file systems
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_ext_os_path_001.html
- util.Math – advanced maths
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_ext_util_math.html
- nase.StringBuffer – manipulating strings
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_ClassStringBuffer.html
- nase.StringTokenizer – splitting strings
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_ClassStringTokenizer.html
- util.JSON – JSON
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_ext_util_JSON.html
- XML
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_gws_XML_Library_001.html
- util.regexp - Regular Expressions
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_ext_util_Regexp.html



IMPORT *c-library*

- C functions implemented in shared libraries can be called from the Genero application code.
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_CExtensions_001.html
- Write your own custom libraries in c
- OR use existing standard libraries by writing some 'wrapper functions'
- Note:
 - Platform specific



IMPORT JAVA

➤ Access to the wide world of Java libraries via IMPORT JAVA

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_programs_IMPORT_JAVA.html

➤ Popular examples

- Apache POI
 - Read/write Excel, Word
 - https://github.com/FourjsGenero/fgl_apache_poi



IMPORT FGL

➤ Remove the linking step from compilation by using IMPORT FGL

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_programs_IMPORT_FGL.html

➤ Explicitly state in a module what other 4gl modules are required, and then use its functions, types, variables

```
IMPORT FGL foo
```

```
...
```

```
DEFINE x foo.my_type
```

```
CALL foo.bar()
```

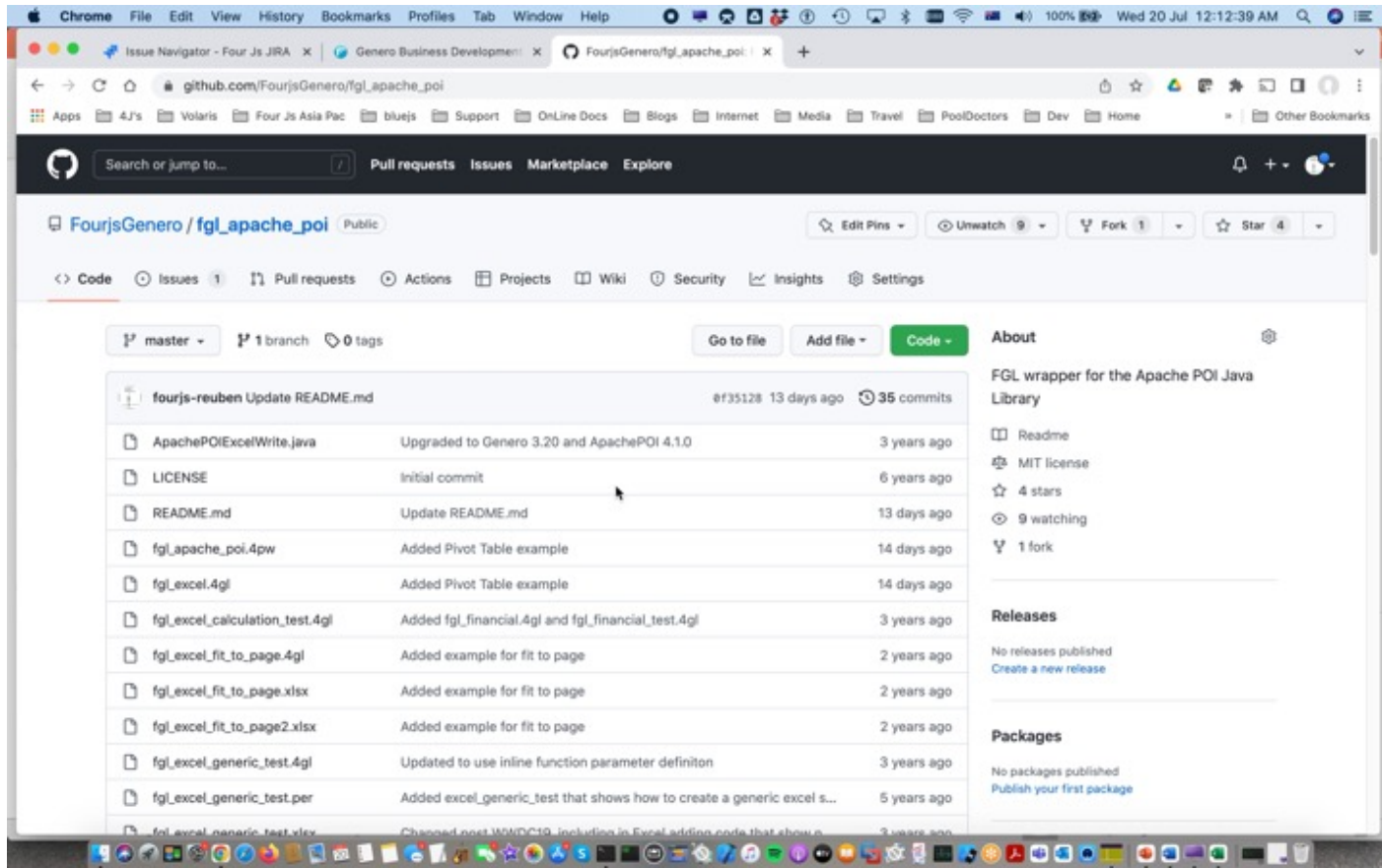
```
LET x = foo.y
```

➤ Ability to state by using PRIVATE/PUBLIC if variables, types, functions can be used by other modules.



DEMO

- Demo of use of IMPORT JAVA and IMPORT FGL in https://github.com/FourjsGenero/fgl_apache_poi



Localization

➤ Internationalize Your Application With Localized Strings

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_localized_strings_001.html

➤ Replace strings you want to localize with %"token"

```
DISPLAY %"token"
```

➤ Or to translate value of a variable

```
DISPLAY LSTR(variable)
```

➤ Edit and compile strings file

```
"Token" = "translated value"
```

```
"hello" = "bonjour"
```

➤ At runtime value, token will be looked up from compiled strings file. Use environment variables to point at different strings file for different languages.



Compilation and Runtime Tools

➤ fglcomp, fglform options including

- -M write errors to stdout instead of producing files
- --format - beautifier
- -W warnings
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_tools_fglcomp.html
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_tools_fglform.html

➤ Pre-processor

- Transform sources before compilation
 - File inclusion
 - Conditional compilation
 - Expand macro
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_preprocessor_001.html



Compilation and Runtime Tools

➤ Code Coverage

- See what lines of code are being executed by your testing
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_coverage.html

➤ Profiler

- Analyse where your code is spending time
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_profiler_001.html

➤ FGSQLDEBUG

- Trace SQL instructions
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_EnvVariables_FGSQLDEBUG.html

➤ Trace

- Understand program flow by executing trace to see what functions are called with what arguments
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_prog_trace.html



Documentation Generator

➤ Generate documentation from your source code

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_AutoDoc_001.html

➤ Process is ...

- Insert formatted comments into your source code
- `fglcomp --build-doc ...` to generate documentation



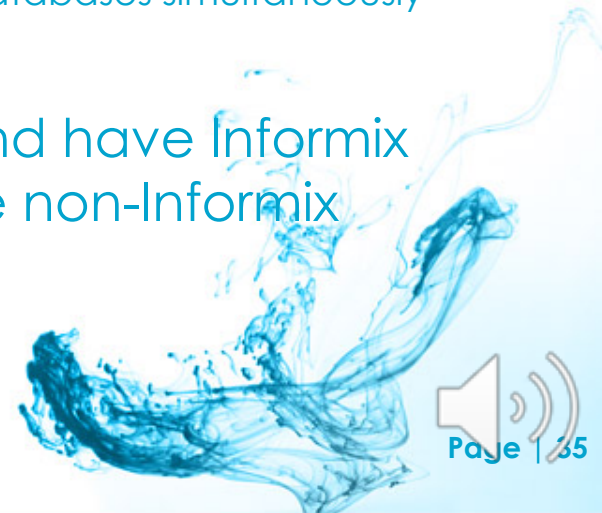
Database

➤ DATABASE has two uses. Replace with ...

- SCHEMA
 - Hit the database once to generate a schema file
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_DatabaseSchema_001.html
- CONNECT TO
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_connections_multi_session_mode.html
 - Indirect specification
 - Do not need to recompile to switch database, connection information in configuration file FGLPROFILE
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_Connections_014.html
 - Multiple Database Connections
 - Can maintain a connection to two or more databases simultaneously

➤ ODI Layer

- Can connect to different databases and have Informix syntax and datatypes translated for the non-Informix databases



Second Step: Evaluate and Improve



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Third Step: Implement One Product At A Time



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Genero Web Services



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Genero Web Services

- **Both consume and expose Web Services**
- **SOAP and RESTful concepts**
- **Uses XML, JSON libraries**
- **To expose a FUNCTION as a Web Services**
 - Add attributes to the function definition and function parameters
 - Review stateless i.e. modular and global variables, cursors
 - Review any UI in your web service code i.e. no ERROR
 - Host using Genero Application Server
- **To consume a web services**
 - High-level, generate code with fglwsdl / fglrestful from service definition (.wsdl, openapi.json, openapi.yaml)
 - Low-level, hand code equivalent code



Making My First Web Service

➤ Take a simple function, and add Web Service Attributes ...

```
FUNCTION add(  
    a INTEGER ATTRIBUTES (WSParam) ,  
    b INTEGER ATTRIBUTES (WSParam)  
)  
ATTRIBUTES (WSGet, WSPath="/Add_wsparam/{a}/{b}")  
RETURNS INTEGER
```

```
DEFINE c INTEGER  
  
    LET c = a + b  
    RETURN c  
END FUNCTION
```



Making My First Web Service

➤ Have a parent program to manage the web service

```
IMPORT com
IMPORT FGL calculator_server

MAIN
DEFINE result INTEGER

    CALL com.WebServiceEngine.RegisterRestService("calculator_server","Calculator")
    CALL com.WebServiceEngine.Start()
    WHILE TRUE
        LET result = com.WebServiceEngine.ProcessServices(-1)
    END WHILE
END MAIN
```



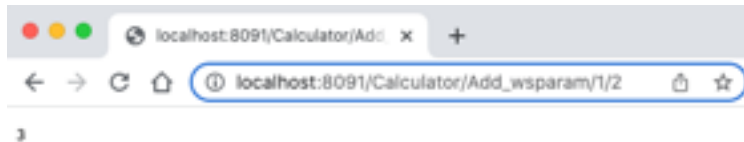
Making My First Web Service

➤ Run program and make calls to it via ...

- curl

```
curl "localhost:8091/Calculator/Add_wsparam/1/2"  
3
```

- Type URL in a browser



Making My First Web Service

- **What will be different with your production web service ...**
 - The name of the function
 - The number of parameters
 - More use of the many WS attributes
 - More error handling
 - Expose via Genero Application Server



Consuming My First Web Service

➤ Find the service definition ...

```
curl "localhost:8091/Calculator?openapi.json"
```

➤ Generate file from this service definition ...

```
fglrestful -o calculator_client.4gl "http://localhost:8091/Calculator?openapi.json"
```

➤ IMPORT FGL and call this web service

```
IMPORT FGL calculator_client
```

...

```
CALL calculator_client.add_wsparam(1,2) RETURNING wsstatus, result
```



First Step with Genero Web Services

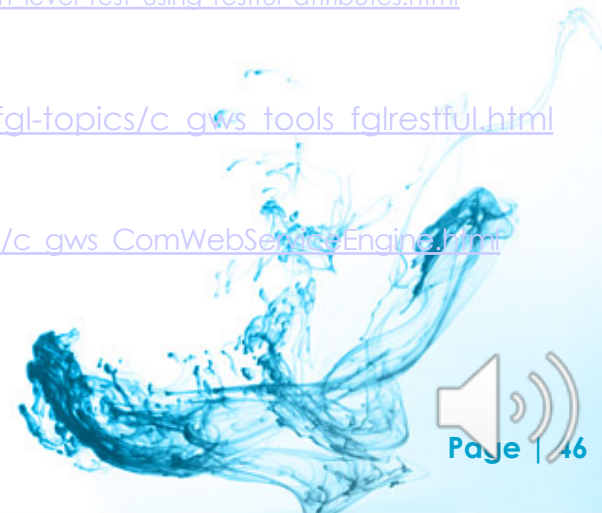
- Evaluate using a simple function
- Expose simple function as a web service
- Review what WS attributes are available
- Generate code to consume it as a web service
- For functions you want to expose, review ...
 - stateless
 - no UI
 - no code based on owner of process
- **Study for production, Genero Application Server and use of Web Server**



First Step with Genero Web Services

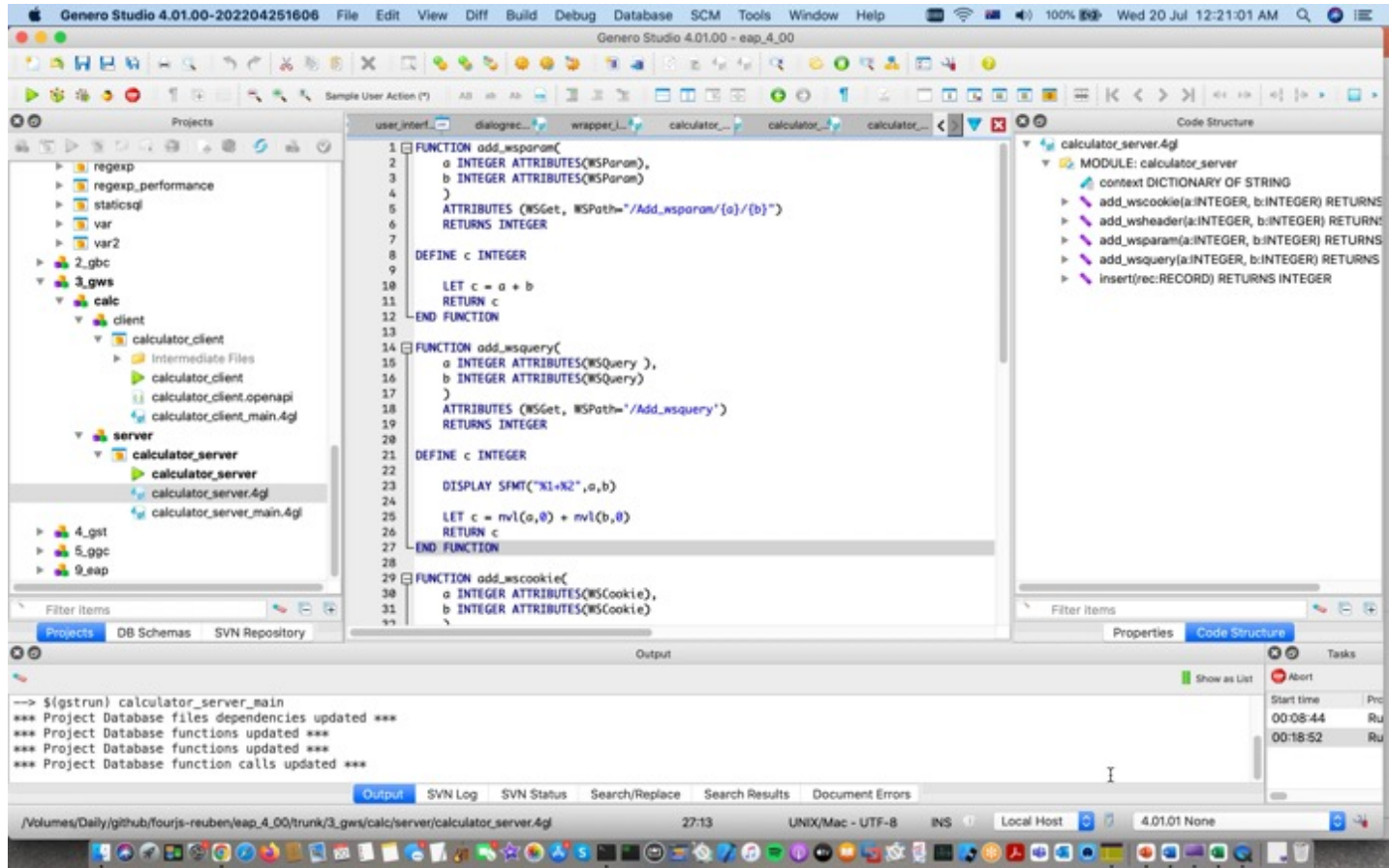
➤ Useful documentation

- Web Services
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_gws_section.html
- Ask Reuben Articles
 - <https://4js.com/ask-reuben/ig-116/>
 - <https://4js.com/ask-reuben/ig-117/>
 - <https://4js.com/ask-reuben/ig-118/>
- Quick Starts
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_gws_restful_high_level_quick_starts.html
- Web Service Attributes
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_gws_high_level_rest_using_restful_attributes.html
- fglrestul
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_gws_tools_fglrestful.html
- com.WebService.Engine
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_gws_ComWebServiceEngine.html



DEMO

➤ Demo Genero Web Services



Genero Report Writer



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Genero Report Writer

- **Genero Report Writer documentation in Genero Studio documentation**
 - http://4js.com/online_documentation/fjs-gst-manual-html/#gst-topics/c_gst_grw_intro.html
- **Very good demo in Tutorials & Samples tab of Genero Studio.**
- **Genero Studio not initially required for Genero Report Writer but is needed to edit Report Design Document (.4rp) files.**



Genero Report Writer - Compatibility

➤ Modify an existing report, before START REPORT add ...

```
DEFINE grw om.SaxDocumentHandler  
  
...  
  
IF fgl_report_loadCurrentSettings(NULL) THEN  
    CALL fgl_report_selectPreview(TRUE|  
    CALL fgl_report_selectDevice("PDF")  
    LET grw = fgl_report_commitCurrentSettings()  
END IF  
  
START REPORT report-name TO XML HANDLER grw
```

➤ Experiment with other fgl_report... function calls

- http://4js.com/online_documentation/fjs-gst-manual-html/#gst-topics/c_grw_API_functions_intro.html



Genero Report Writer - GUI

- For GUI reports, need to pass the name of the report design to `fgl_report_loadCurrentSettings` e.g.
 - IF `fgl_report_loadCurrentSettings("Invoice.4rp")`

- Your **REPORT** instruction should then be concerned with gathering of data, and have no layout instructions

```
BEFORE GROUP OF header
```

```
    PRINT header.*
```

```
ON EVERY ROW
```

```
    PRINT detail.*
```

```
AFTER GROUP OF header
```

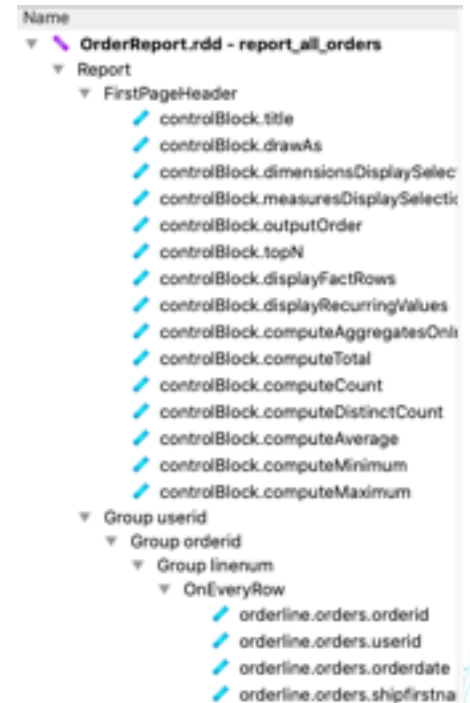
```
    LET header_sum.value = GROUP SUM(header.value)
```

```
    PRINT header_sum.*
```



Genero Report Writer - GUI

- Generate a report data schema (.rdd) file
 - fglcomp –build-rdd filename.4gl
- Reference the .rdd file when designing a report



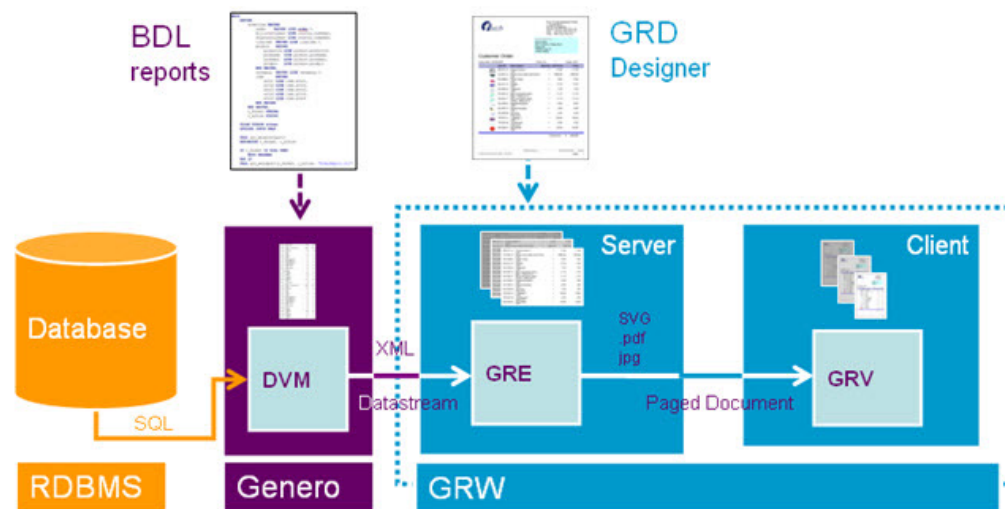
Genero Report Writer - Architecture

➤ Understand the architecture

- http://4js.com/online_documentation/fjs-gst-manual-html/#gst-topics/c_grw_bdl_runtime_arch.html

➤ Key point

- 3 parties, Designer, Engine, Viewer
- Input to report engine is a datastream and a design



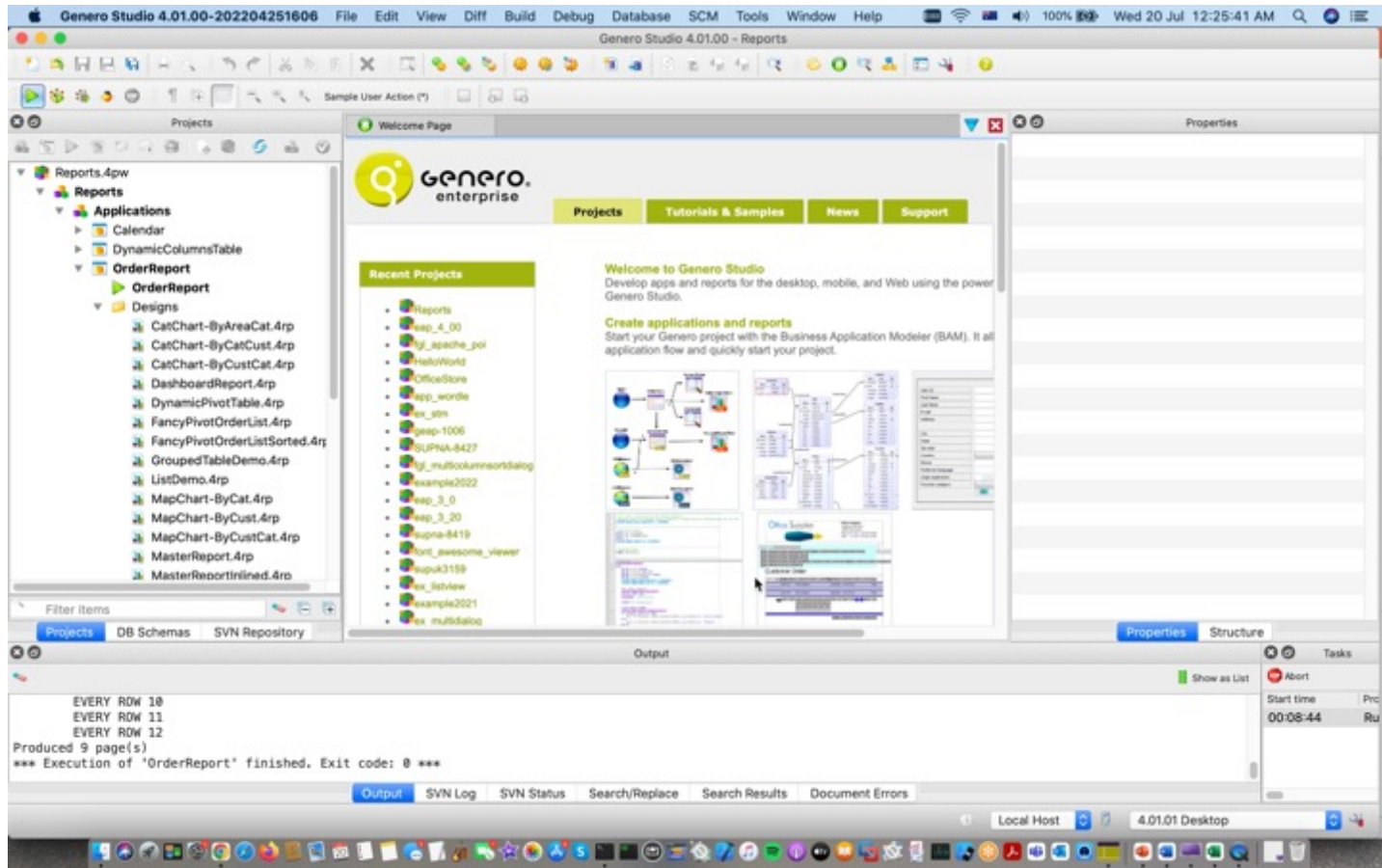
First Steps with Genero Report Writer

- Find and run examples in Tutorials & Samples tab of Genero Studio
- Output one of your existing reports in compatibility mode
- Experiment with various fgl_report... functions to note the output options (PDF etc.)
- Change a REPORT statement to concentrate solely on gathering of data
- Generate .rdd and Design a .4rp report
- Output this report
- Decide what reports you want to use Genero Report Writer for
 - Public facing reports vs Internal reports
 - Look for patterns



DEMO

➤ Demo Genero Report Writer



Genero Studio



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Explore

➤ Explore using Genero Test Drive

- <https://4js.com/download/test-drive/>
- Explore using your PC in a separate area away from your existing environment

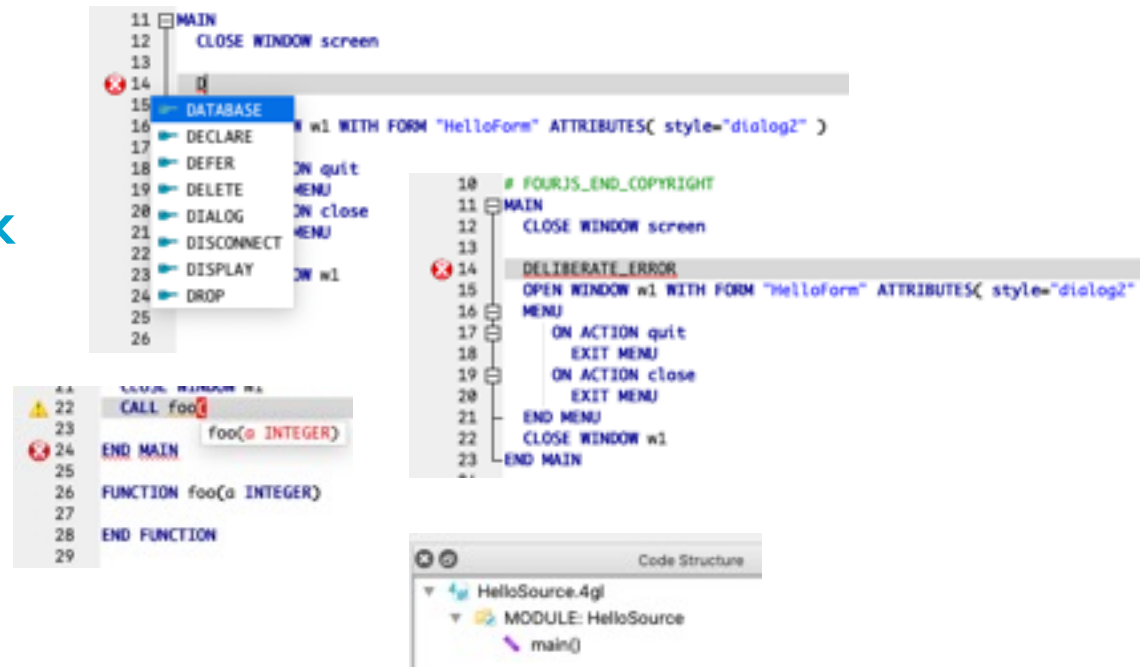
➤ From Tutorials & Samples, use HelloWorld or create your own little program

- Explore the Code Editor
- Explore the Form Designer
- Explore the Projects View
- Explore the Genero Configuration Management
- Explore the Preferences
- Explore the Debugger



Code Editor

- Code Completion
- Real time syntax check
- Symbol Definitions
- Code Structure View
- Editing XML
- Beautifier (Edit->Format&Indent)



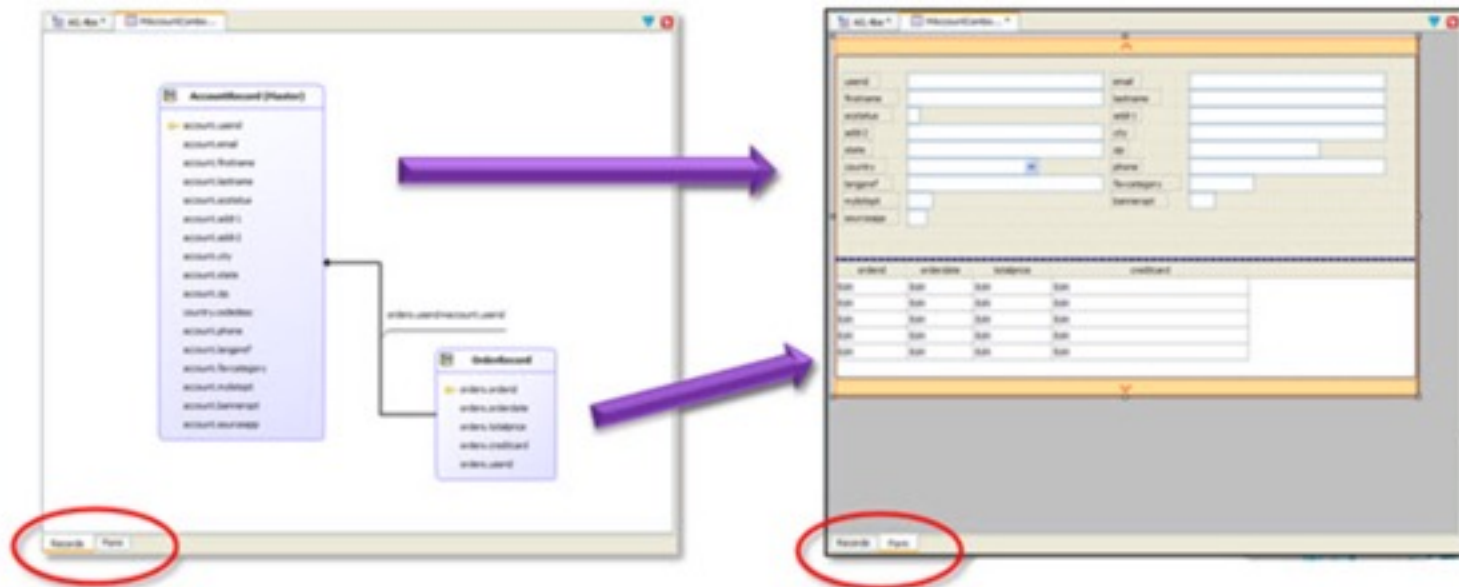
Form Designer

➤ GUI Form Designer

- Design Both Screen Records and Form

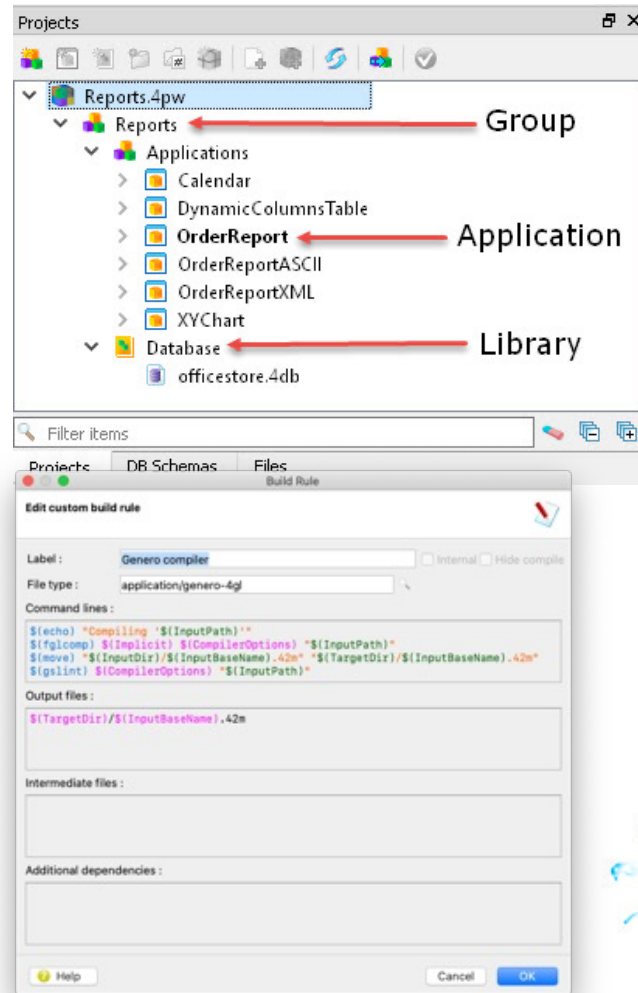
➤ Not Mandatory

- You can still edit .per in Code Editor



Projects View

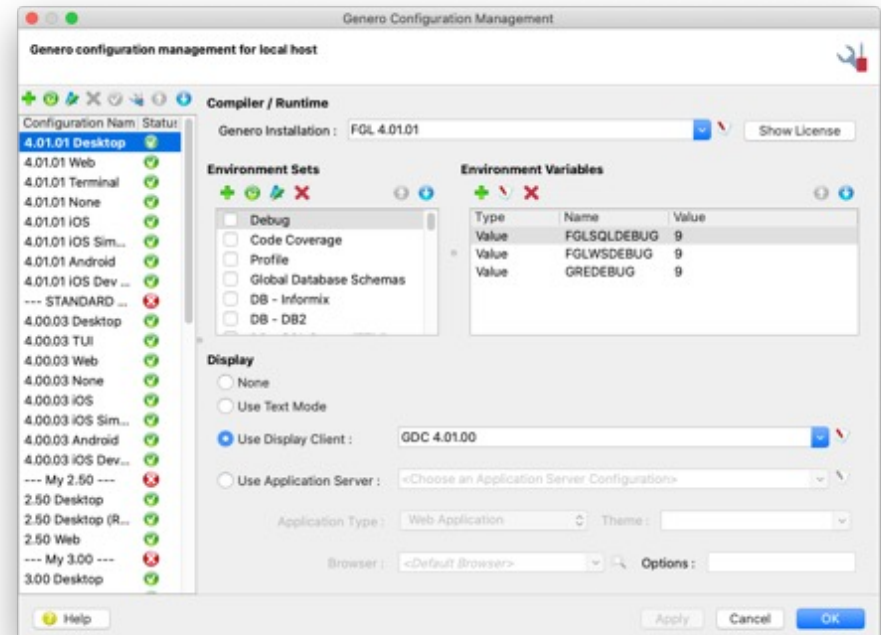
- Organizes files in your project
- Build Rules control how files are compiled, executed



Genero Configuration Management

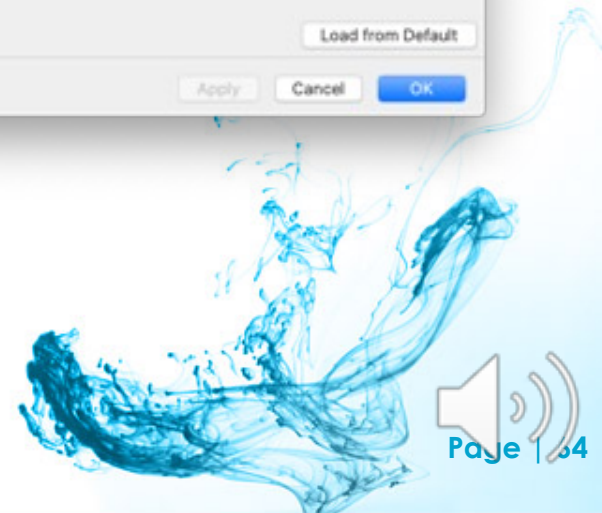
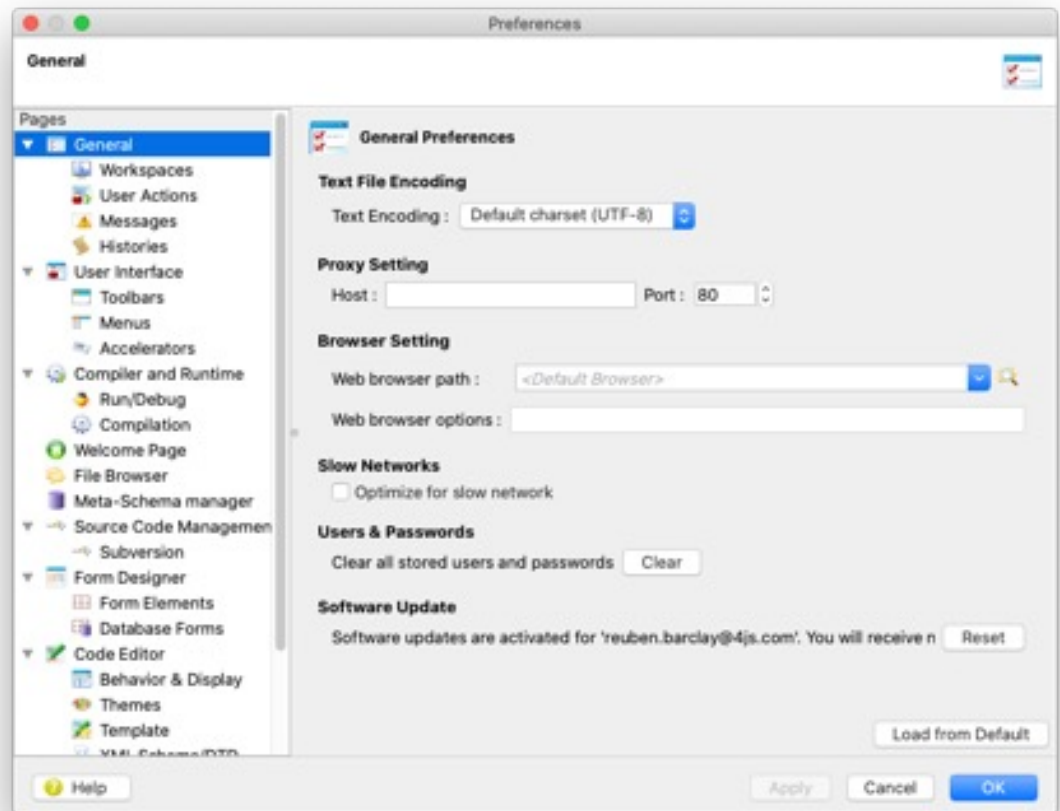
➤ Information needed to run Genero commands

- What Genero installation
- What environment variables are set
- What front-end client



Preferences

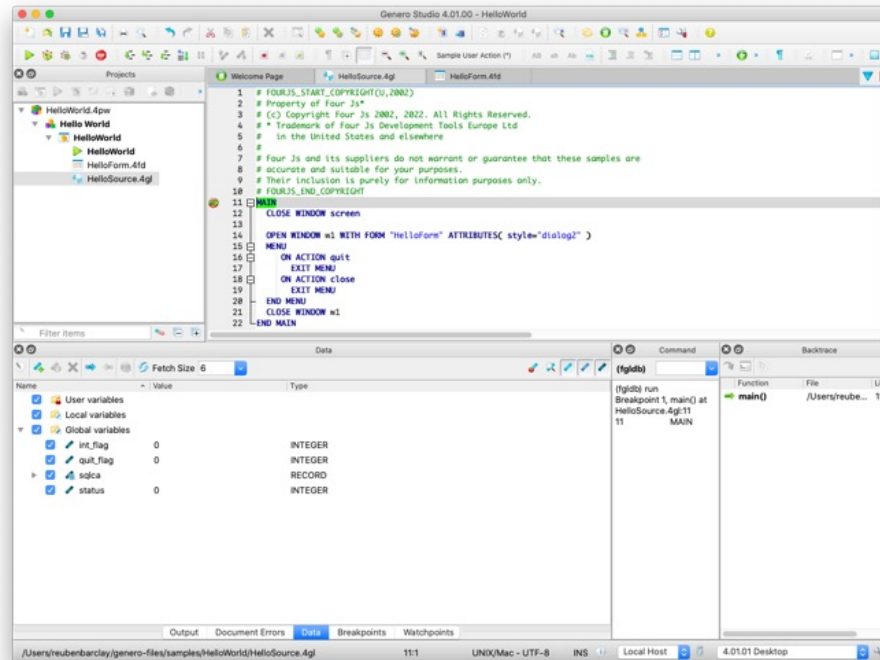
➤ Explore Preferences



Debugger

➤ Graphical Debugger

- http://4js.com/online_documentation/fjs-gst-manual-html/#gst-topics/c_section_graphical_debugger.html



Consider how to fit to your development environment

- **Local v Remote Configuration**
- **How to create .4pw for you existing source**
 - One .4pw or one per application or somewhere in between?
- **Mould to fit your development environment**
 - Build Rules
 - Genero Configuration Management
 - Preferences
 - User Actions
 - File->New
 - Templates (Control T in Code Editor)



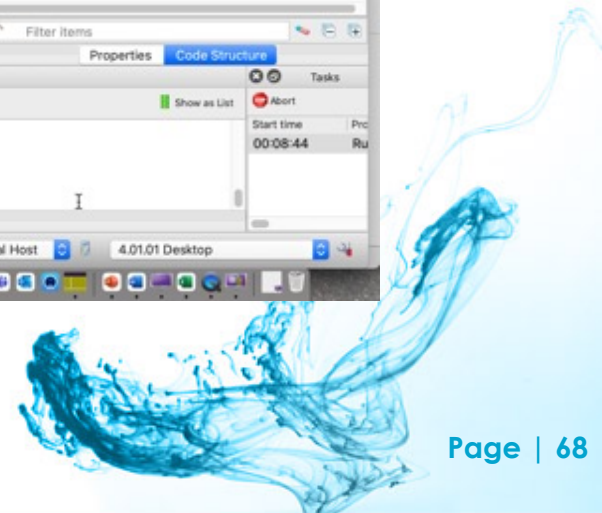
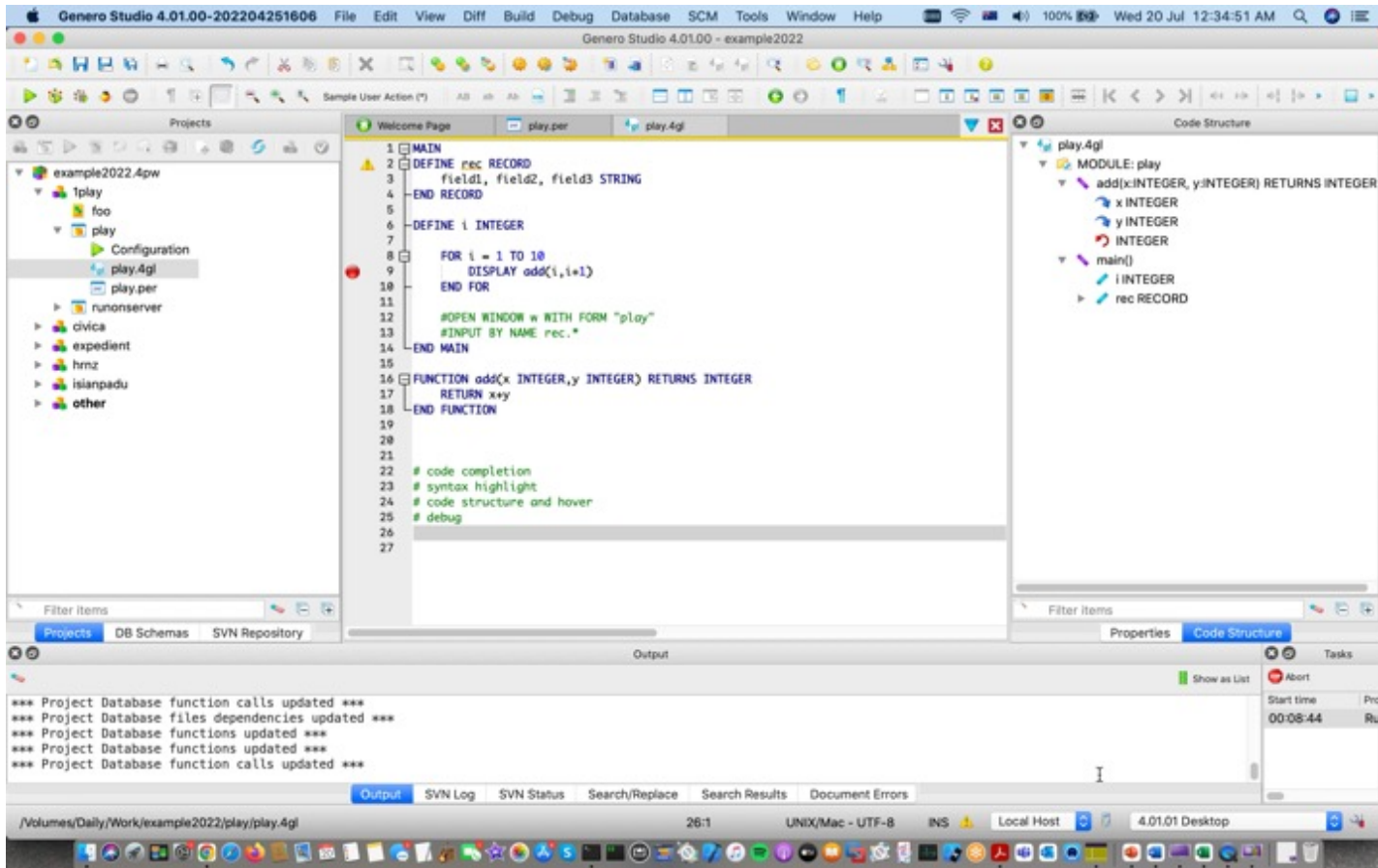
First Steps with Genero Studio

- Explore
- If possible, use purely to edit files and/or debug
- Consider how to fit into your development environment
 - Configure Studio to meet your needs
 - Also be prepared to change way you do things to meet Genero Studio



DEMO

➤ Demo Genero Studio



Genero Application Server



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Genero Application Server

➤ What is Genero Application Server

- Manages communication between front-end and Genero runtime
- Embeds a Web Server



After Installation

- Run demos.html
- Run Genero Demos from this page

The image shows two browser windows. The top window displays the 'Welcome to the Genero Application Server 4.01.00' page, which includes the Genero logo and a link to release notes. The bottom window shows a 'Demos' directory browser with a table of demo files and their descriptions.

Topic	Program	Arguments	Type	Description
f_cust.per	f_cust.per		[icon]	Form Specification Files (.per/.42f)
f_states.per	f_states.per		[icon]	Form Specification Files (.per/.42f)
globtb.4tb	globtb.4tb		[icon]	Toolbar files (.4tb)
globtm.4tm	globtm.4tm		[icon]	Topmenu files (.4tm)
myactdefs.4ad	myactdefs.4ad		[icon]	Action Defaults (.4ad)
mydb.sch	mydb.sch		[icon]	Database Schema Files (.sch/.val)
mydb.val	mydb.val		[icon]	Database Schema Files (.sch/.val)
myhelp.msg	myhelp.msg		[icon]	Message Files (.msg/.iem)
mystyles.4st	mystyles.4st		[icon]	Presentation Styles (.4st)
p_cust.4gl	p_cust.4gl		[icon]	Programs/Modules (.4gl/.42m)
p_cust.prf	p_cust.prf		[icon]	Configuration File (FGLPROFILE)
p_cust.str	p_cust.str		[icon]	String Resources (.str/.42s)
toolbar1.inc	toolbar1.inc		[icon]	Using the preprocessor (.inc)

The Sample1 demo

This little example is provided to show all program components.
Files used by this example are:
- Programs/Modules (.4gl/.42m)
- Form Specification Files (.per/.42f)
- Using the preprocessor (.inc)
- Database Schema Files (.sch/.val)
- Message Files (.msg/.iem)

.xcf Configuration

- Genero Application Server configuration is based around .xcf files
- Amongst .xcf responsibilities is configuration that takes an HTTP Request received (i.e URL) and executes the following...

```
cd directory  
export environment_variables = value  
fglrun program arguments
```

- Learn how to add .xcf entry to run your program via Genero Application Server. This technique needed for
 - Web Services
 - Programs running in Browser
 - Programs running on Desktop Client can also optionally go through Genero Application Server



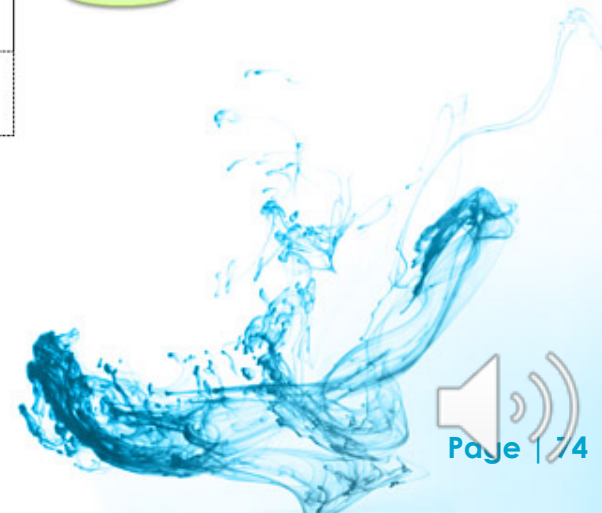
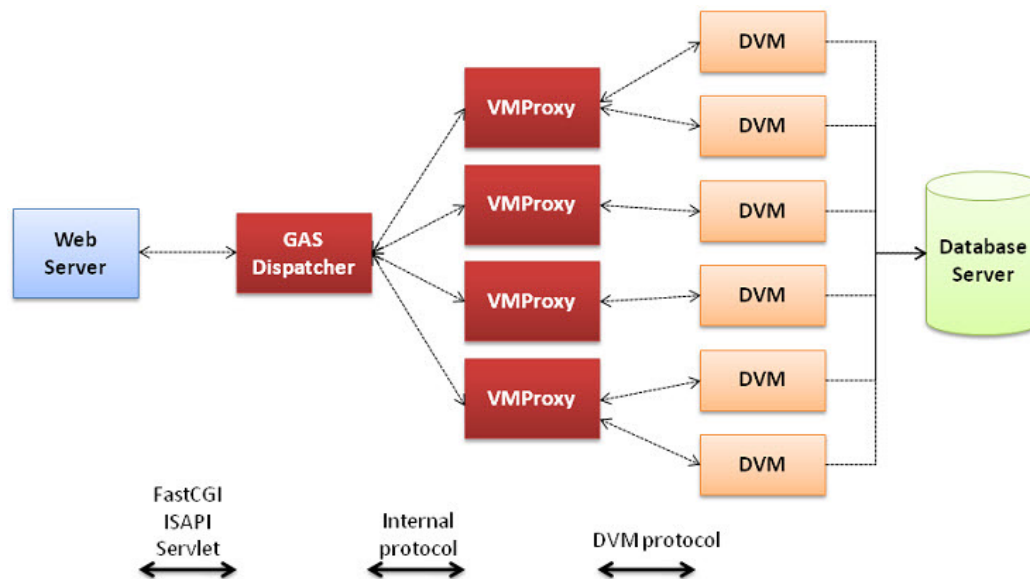
Application Changes

- For any program running through Genero Application Server ...
 - Who is the process owner?
- You may need to change code to reflect fact the process owner is not associated with the person sitting at the terminal



Architecture

- Understand role of dispatcher, proxy, and Genero application
 - http://4js.com/online_documentation/fjs-gas-manual-html/#gas-topics/c_gas_architecture_ovw.html
- Understand that Web Server will be needed for production



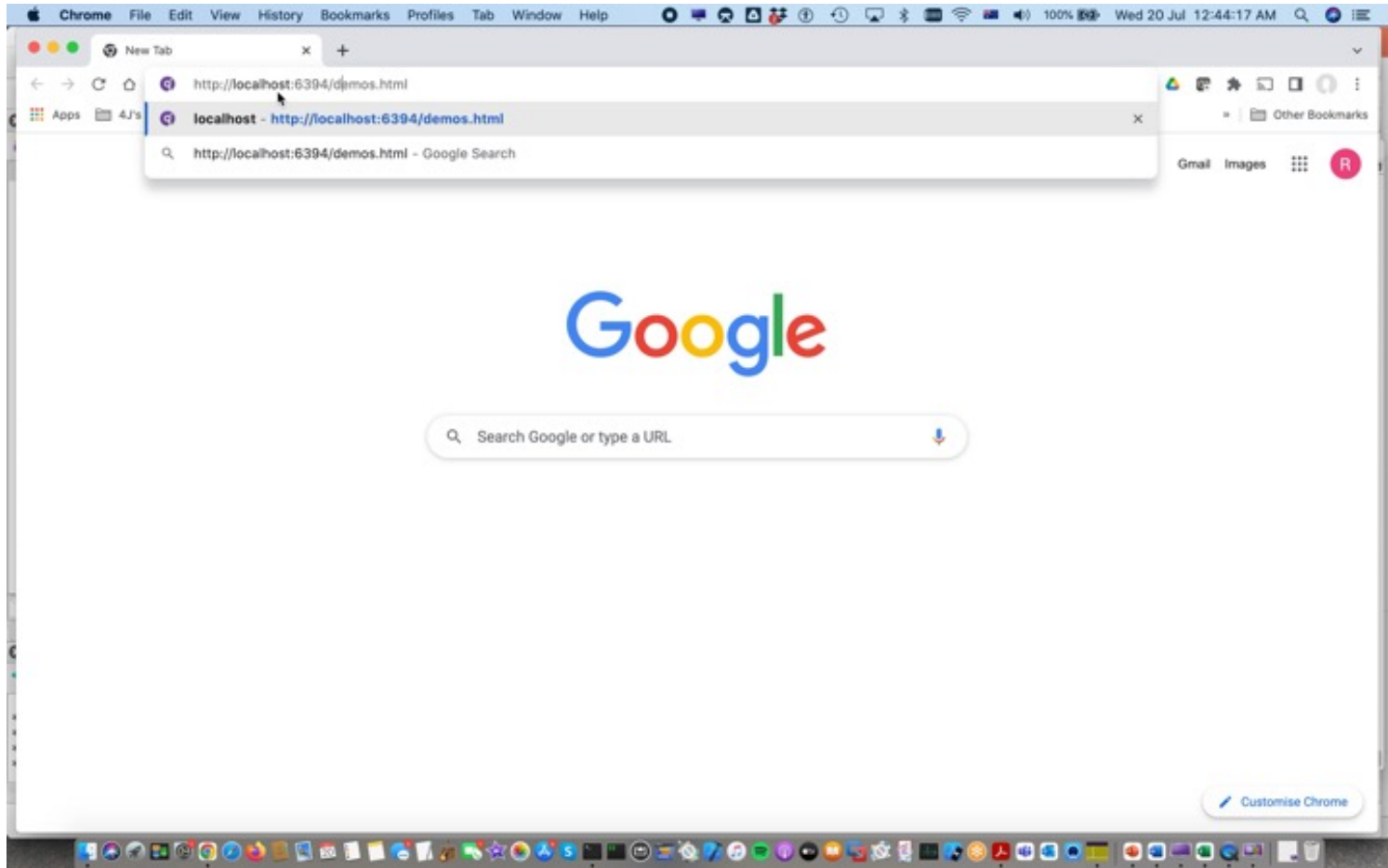
First Steps with Genero Application Server

- Installation Tests
- Run Genero demo programs
- Amend .xcf configuration so that your program can be run via Genero Application Server
- Be prepared to amend Genero application if dependent on the process owner.



DEMO

➤ Demo Genero Application Server



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GUI Interface



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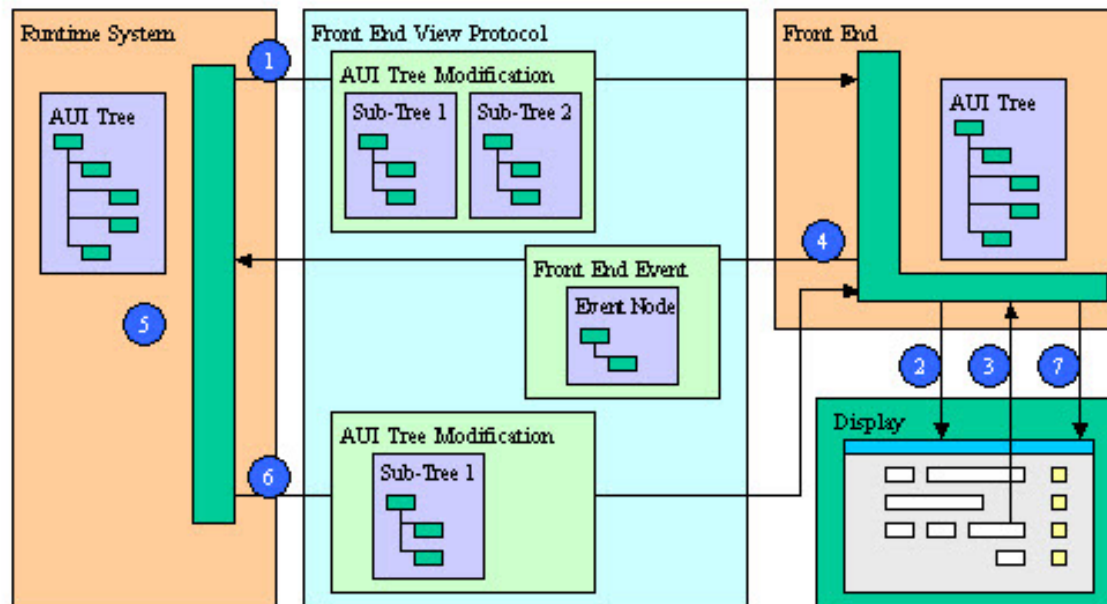
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GUI Architecture

➤ Power of our user interface is via Dynamic User Interface, the AUI Tree and the Front End View protocol. This all happens behind the scenes

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_DynamicUI_001.html
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_feconn_protocol.html



Genero Desktop Client (GDC)

- **GDC is an executable that sits on front-end**
 - http://4js.com/online_documentation/fjs-gdc-manual-html/#gdc-topics/c_gdc_section_general.html
- **Renders the AUI tree and returns user action back to the runtime system**
- **Starting a program in development**
 - GDC listen on port, fgldrun communicates with GDC via FGLSERVER
- **Starting a program in production**
 - GDC on desktop, initiates connection to runtime system
 - Direct Connection – logs into server and executes commands to start Genero application
 - HTTP – via Genero Application Server



GUI – Traditional Mode

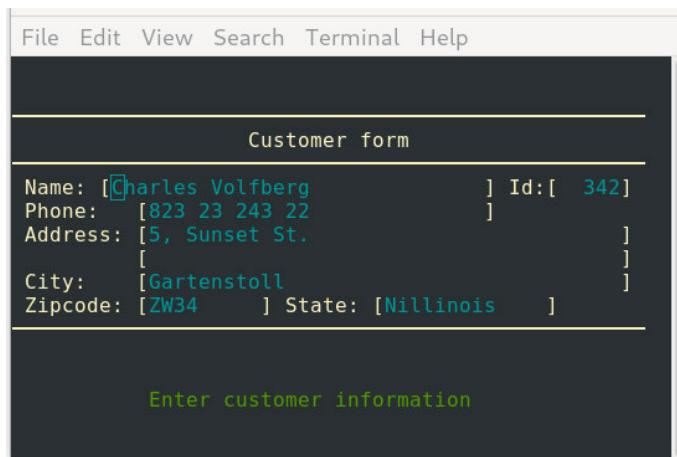
➤ Used to ease transformation ...

- Renders SCREEN faithfully in a GUI window
- User can use mouse to move cursor
- User can click buttons as alternative to accelerator key

➤ Useful for slow transformations

- Transform important programs first, use traditional mode for less important programs as you work on them one by one

http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_DynamicUI_005.html

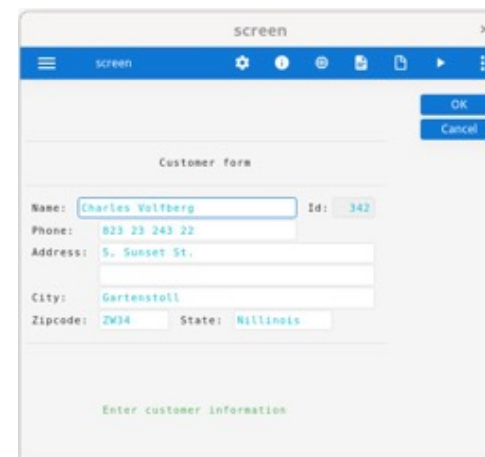


```
File Edit View Search Terminal Help

Customer form

Name: [Charles Volberg] Id: [ 342]
Phone: [823 23 243 22]
Address: [5, Sunset St.
City: [Gartenstoll
Zipcode: [ZW34] State: [Nillinois]

Enter customer information
```



screen

screen

OK
Cancel

Customer form

Name: Charles Volberg Id: 342
Phone: 823 23 243 22
Address: 5, Sunset St.
City: Gartenstoll
Zipcode: ZW34 State: Nillinois

Enter customer information



GUI – SCREEN -> LAYOUT

➤ GUI – Graphical Mode Rendering

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_DynamicUI_004.html

➤ Within .per, replace SCREEN with LAYOUT

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_FormSpecFiles_LAYOUT_section.html

➤ Within LAYOUT, use new syntax to arrange forms using GUI Containers and Widgets



GUI – SCREEN -> LAYOUT

➤ Assign widgets to fields

- Start with field

```
f01 =formonly.field
```

- Add widget at beginning

```
BUTTONEDIT f01 = formonly.field
```

- Add attributes at end

```
BUTTONEDIT f01 = formonly.field, ACTION=zoom
```

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_FormSpecFiles_elements.html



GUI – SCREEN -> LAYOUT

➤ Arrange fields using containers

- Start with SCREEN

```
SCREEN
{
[f01][f02      ][f03  ]
}
END
```

- Change to LAYOUT and arrange in containers

```
LAYOUT
GROUP grp1
TABLE tab1
{
[f01][f02      ][f03  ]
}
END #TABLE
END #GROUP
END
```



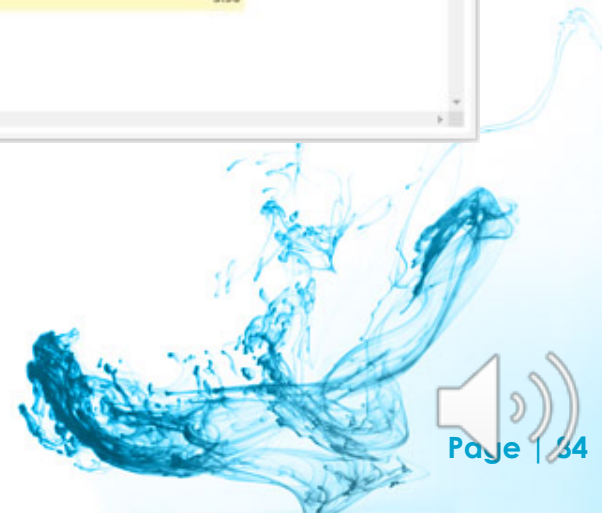
GUI – Presentation Styles

➤ Centralize appearance of your application

- Centralize via Presentation Styles
- Remove ATTRIBUTES from 4gl code base
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_presentation_styles_001.html

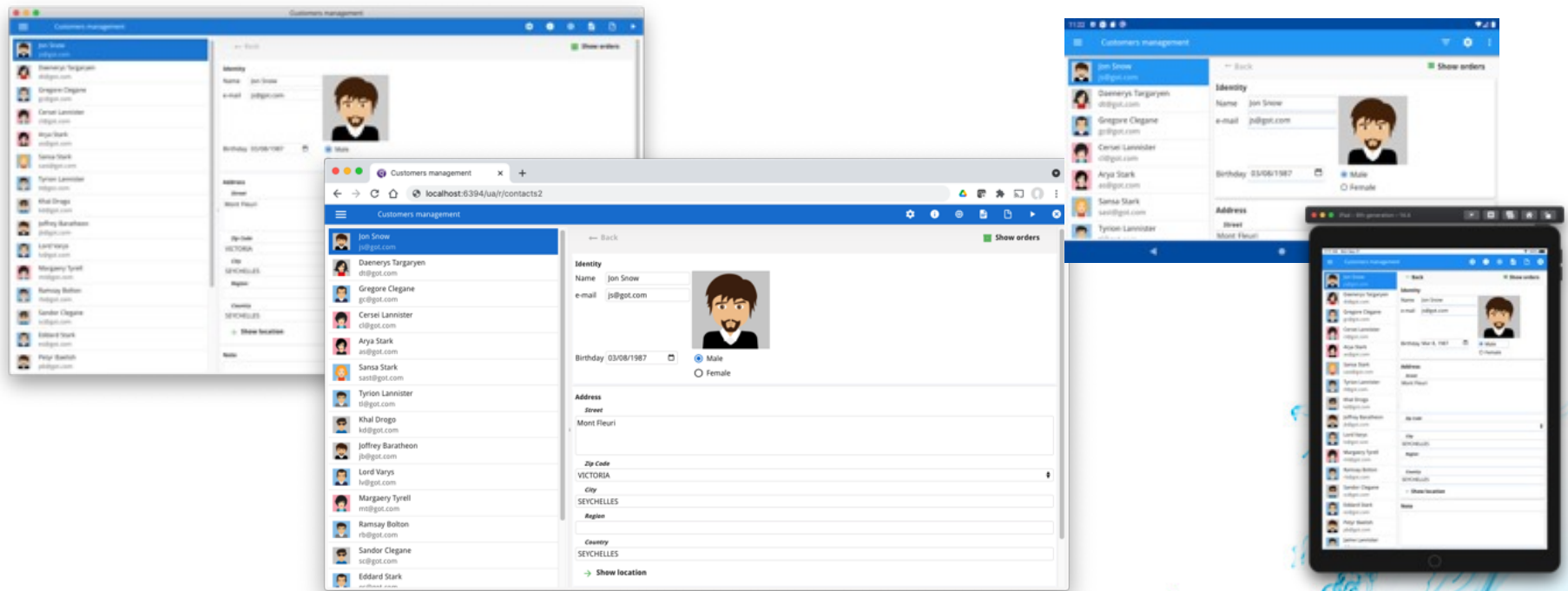
LineNo	Item Name	Price
1	Red Socks S3	2.45
2	Blue Socks S2	2.25
3	White Socks S3	1.20
4	Handgloves S1	3.25
5	Handgloves S2	3.50

LineNo	Item Name	Price
1	Red Socks S3	2.45
2	Blue Socks S2	2.25
3	White Socks S3	1.20
4	Handgloves S1	3.25
5	Handgloves S2	3.50



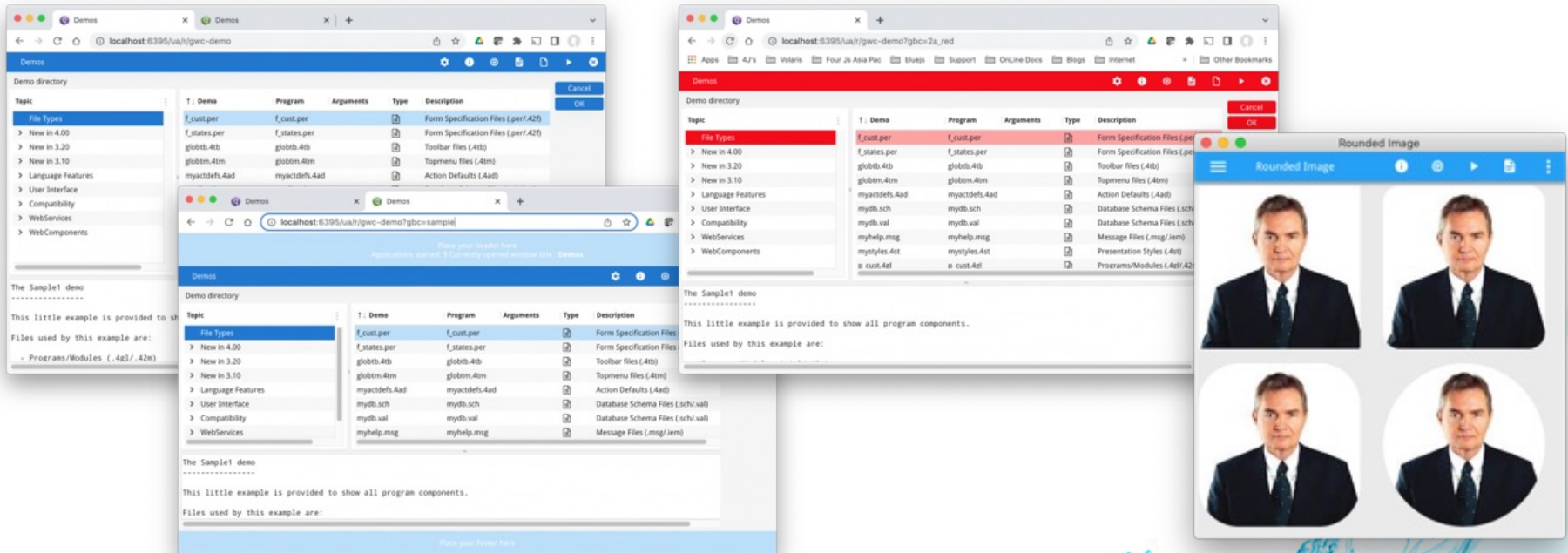
GUI – Universal Rendering

- With 4.00 we standardized on what we call Universal Rendering
 - Consistent user interface on all devices
 - Desktop, Web, Mobile (iOS), Mobile (Android)
 - Uses Web technologies rather than Native widgets
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_Migrate_to_400_universal_rendering.html



GUI – Universal Rendering Customization

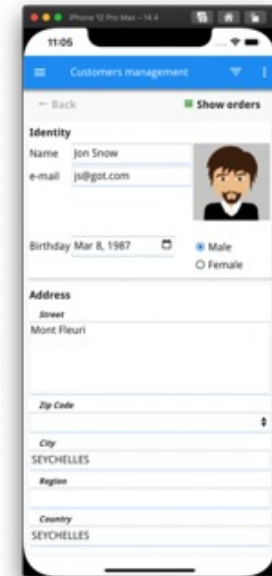
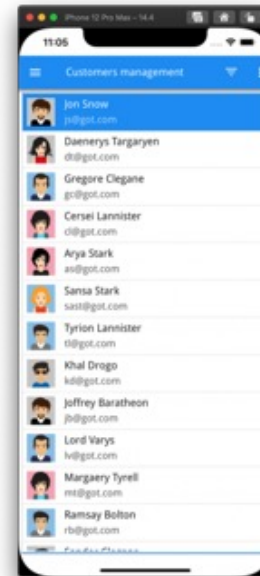
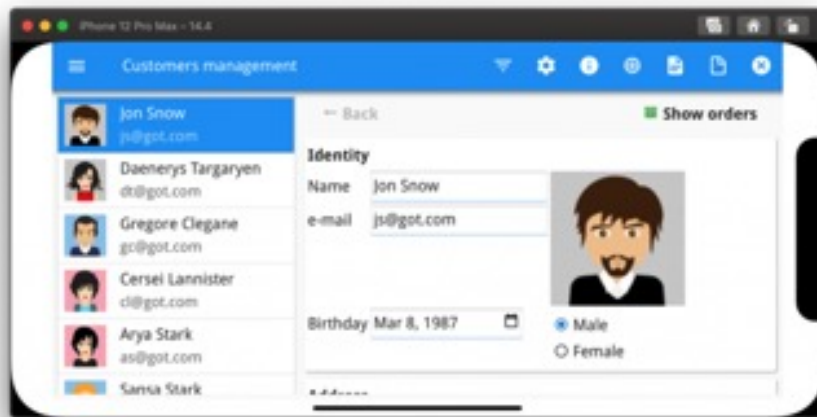
- With Universal Rendering we also give you the sources for the front-end rendering, and you can customize this
 - Apply your corporate look and feel
 - Add GUI options not available in the standard e.g. rounded images
 - http://4js.com/online_documentation/fjs-gbc-manual-html/#gbc-topics/c_gbc_customization.html
 - <https://4js.com/ask-reuben/ig-134/>



GUI – Responsive

➤ Within 4.00 new syntax added to make forms responsive for different sizes

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_form_rendering_responsive.html
- <https://4js.com/2021-genero-enterprise-4-00-available-now/>



WebComponents

➤ External graphical components can be incorporated into your Genero forms

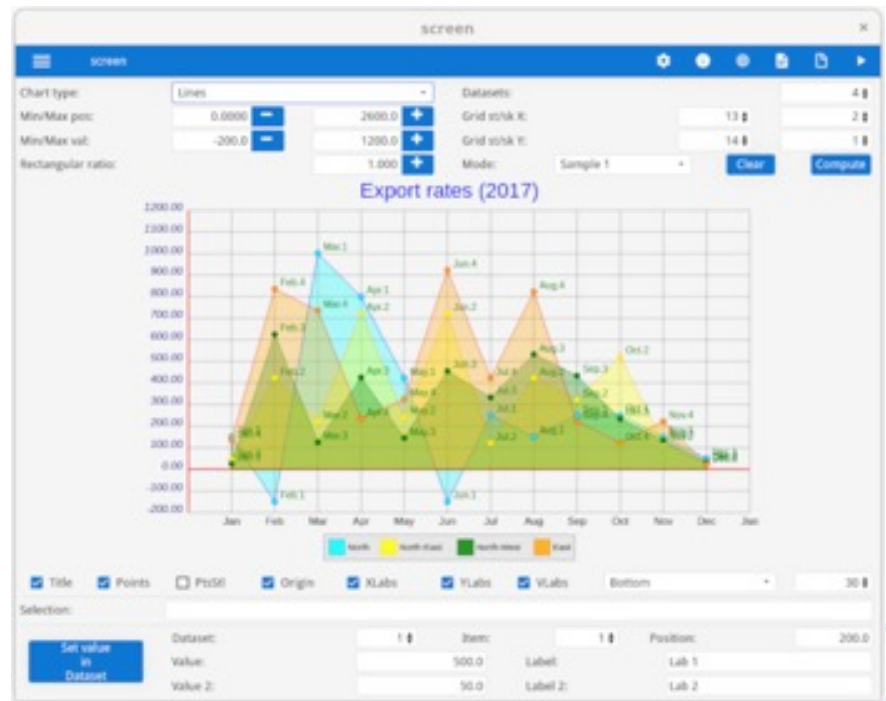
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_webcomponent.html

➤ Example uses include

- Charts/Graphs
- Maps
- Video

➤ fglsvgcanvas

- Create your own svg image inside a web component
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_fgl_web_components_fglsvgcanvas.html



GUI Coding



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Ui package

- Using methods from the ui package, you can change dialog and window and form properties at runtime
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_Class_ui.html
- Examples
 - Ui.Dialog.setActionActive – enable or disable an action
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_ClassDialog_setActionActive.html
 - Ui.Form.setFieldHidden – hide or show a field
 - http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_ClassForm_setFieldHidden.html
- Use these to reduce duplication of 4gl code where you may have had two more forms, or two more dialog statements that were only slightly different



Multiple Dialog

➤ Combine dialogs so that user can click where they expect to click

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_multiple_dialogs_usage.html
- <https://4js.com/ask-reuben/ig-129/>

The screenshot shows a dialog box titled "Starter Pattern" with a blue header bar. Below the header, there are two sections: "Criteria (CONSTRUCT)" and "Print (INPUT)". In the "Criteria" section, there are three input fields: "Order Number", "Customer Code" (containing "A*"), and "Order Date" (containing ">01012022"). These fields are disabled, indicated by a grey background. To the right of these fields, there is a red text overlay that reads: "Unable to click on these fields. Have to click Back button to go back and edit these values". In the "Print" section, there are three input fields: "Printer" (containing "Reception"), "Copies" (containing "1"), and "Collate" (checked). These fields are enabled. On the right side of the dialog, there are three buttons: "OK", "Cancel", and "Back".

The screenshot shows the same "Starter Pattern" dialog box, but with the "Criteria" section fields enabled. The "Order Number" field is now active. The "Customer Code" field still contains "A*", and the "Order Date" field still contains ">01/01/2022". The "Print" section fields remain the same. The "Back" button is no longer visible, and the "OK" and "Cancel" buttons are still present on the right side.

UNBUFFERED

➤ **Switching to UNBUFFERED can reduce your lines of code**

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_prog_dialogs_unbuffered.html

```
LET field = value  
DISPLAY BY NAME field
```

➤ ... becomes ...

```
LET field = value
```

➤ **By using UNBUFFERED mode, program variables and form fields are automatically synchronized**



ON ACTION

➤ Replace various KEY syntax with ON ACTION

ON KEY (F5)

➤ Becomes

ON ACTION zoom

➤ Use Action Defaults (.4ad) to centralize action definitions

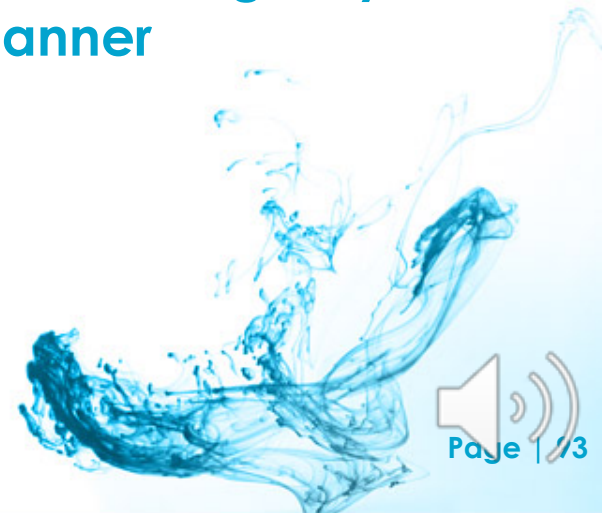
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_action_defaults_files.html

➤ Also use TopMenu, Toolbar to trigger actions

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_toolbars_001.html

- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_topmenus_001.html

➤ Using ON ACTION your code does not need to change if you decide to trigger the action in a different manner



Style Guide

- Encourage you to create a document called a “Style Guide”
- Contains coding standards of what is acceptable GUI code for your system
- Centralize where possible via presentation styles, universal rendering customization
- Transform your sources adhering to the “Style Guide”



For More GUI

- See Morgan's presentation – “Adding responsiveness to your Genero screens”

<https://4js.com/wwdc-21-online-conference-archive/#tab-id-2>

Single Application – Multiple Devices

- Single code base supporting multiple devices

Desktop/Browser

Tablet

Phone

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<https://4js.com/wwdc21online/>
November 29 - December 3 2021

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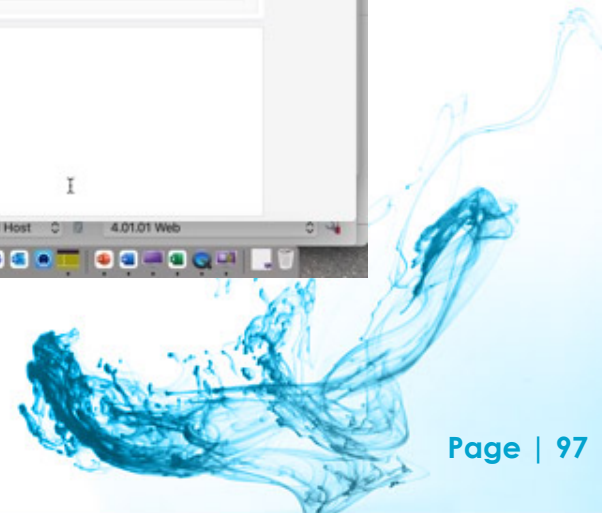
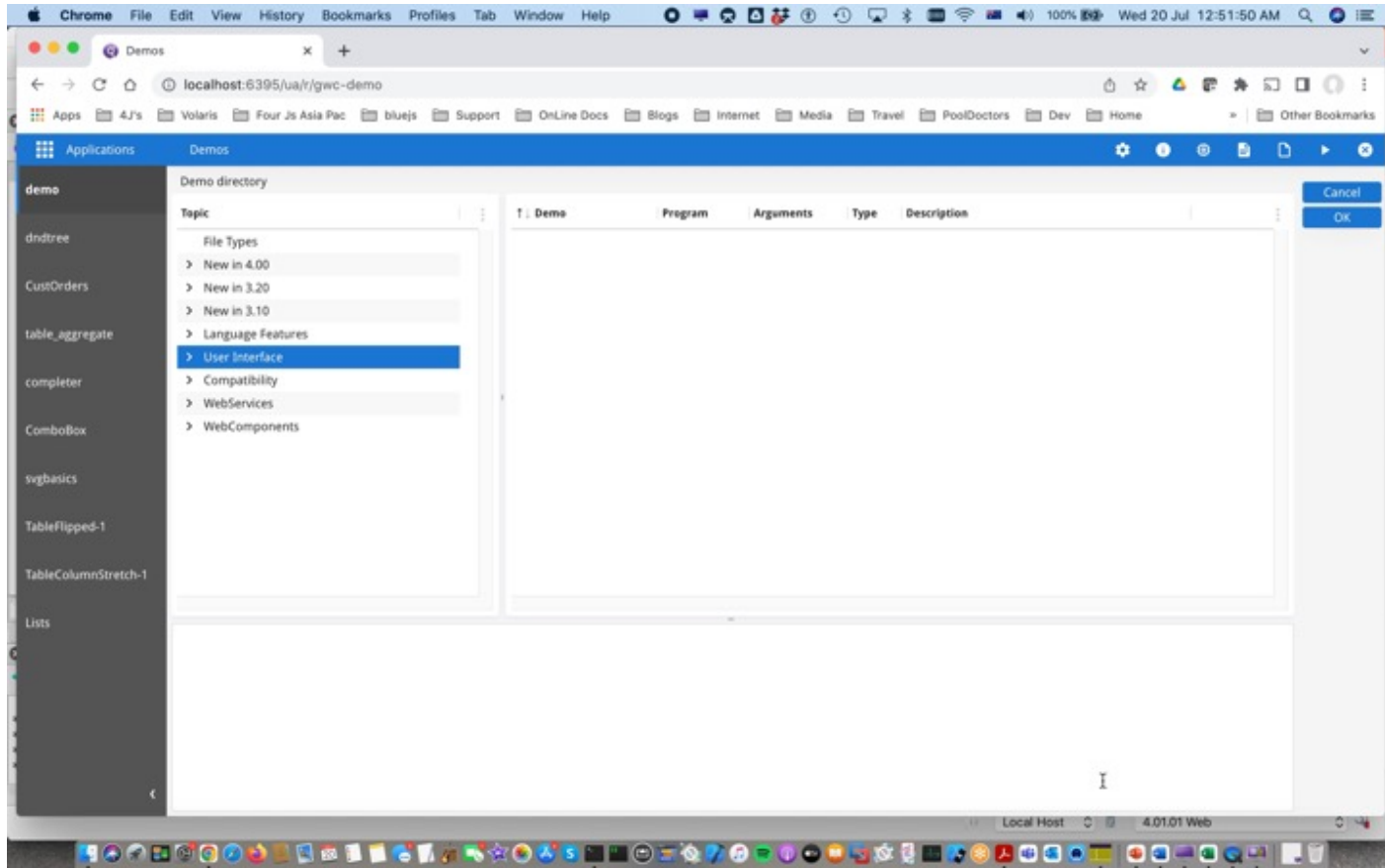
First Steps with GUI

- Traditional Mode via Genero Desktop Client
- Run GUI via Genero Desktop Client
- Take a form and change SCREEN->LAYOUT
- Review available syntax and options
- Create a “Style Guide”
- Transform your sources to meet your “Style Guide”
- Use traditional mode if slow rollout is feasible



DEMO

➤ Demo GUI



Beyond Initial Transformation



FOUR Js
The Power of Simplicity

IIUG Tech Talk by Four Js
<https://www.iiug.org/> <https://4js.com/>
July 2022



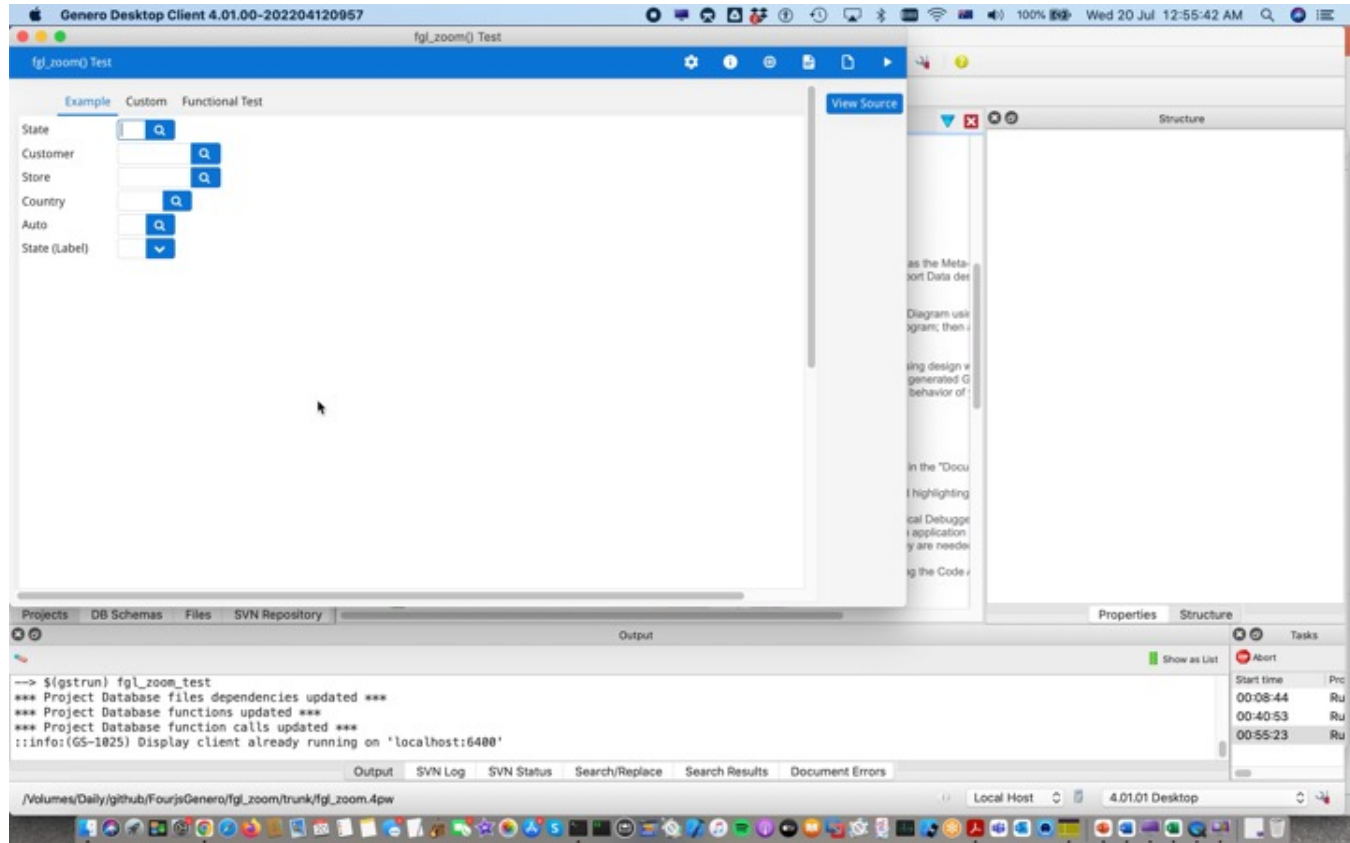
Generic Code

- **Reduce number of lines of code by using generic code techniques**
 - Good example is `fgl_zoom`
 - https://github.com/FourjsGenero/fgl_zoom
 - Tour de GitHub presentation (<https://4js.com/wwdc-21-online-conference-archive/#tab-id-3>)
- **Rather than transforming lots of repeated code patterns, you maybe able to transform quicker using generic code techniques**



DEMO

➤ Demo Generic Code https://github.com/FourjsGenero/fgl_zoom



What Have I Not Mentioned

➤ **BAM - Business Application Modeling**

- Low Code
- http://4js.com/online_documentation/fjs-gst-manual-html/#gst-topics/c_section_bam.html

➤ **Genero Mobile (GMI/GMA)**

- Bundle runtime and front-end and your Genero application to create an app on a mobile device
- http://4js.com/online_documentation/fjs-fgl-manual-html/#fgl-topics/c_fgl_section_mobile_apps.html

➤ **GGC - Genero Ghost Client**

- Testing Tool
 - Run a program and generate a test program from its log
 - Modify test
 - Run test program
- http://4js.com/online_documentation/fjs-ggc-manual-html/

➤ **gslint – Code Quality**

- Tool to enforce code quality
- http://4js.com/online_documentation/fjs-gst-manual-html/#gst-topics/c_gst_code_quality.html



What Have I Not Mentioned

➤ FLM – Four Js License Manager

- https://4js.com/online_documentation/fjs-flm-manual-html/

➤ GIP – Genero Identity Provider

- http://4js.com/online_documentation/fjs-gas-manual-html/#gas-topics/c_gas_gidp_ovw.html

➤ JGAS – Genero Application Server for JAVA

- http://4js.com/online_documentation/fjs-jgas-manual-html/

➤ GAR - Genero Archive / Deployment

- http://4js.com/online_documentation/fjs-gas-manual-html/#gas-topics/c_gas_garchive.html



Summary



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Resources

➤ Documentation

- <https://4js.com/download/documentation/>

➤ Developer Forums

- https://forum.4js.com/fjs_forum/

➤ Training including self-paced training

- <https://4js.com/training/>

➤ Ask Reuben

- <https://4js.com/ask-reuben/>

➤ WWDC

- <https://4js.com/wwdc/>



Test Drive

➤ Evaluate Genero for 30 days

- Download Genero Studio and products
- Compile and run Genero application locally on your PC
- <https://4js.com/download/test-drive/>

➤ AND/OR ask for an evaluation (time-bombed) license to compile and run on your development server.



Support and Professional Services

➤ Use your local support office

- <https://4js.com/support/support-request/?>



➤ If you need additional resources, Professional Services

- <https://4js.com/professional-services/>



Summary

- In 20+ years we have added a lot of functionality
- First Step: Get your existing Informix-4gl running using our product.
- Second step: Evaluate where you can improve your existing application and development environment
- Third step: Focus on an area and improve in that are using one of our products
- Repeat Third step with different Four Js products
- Continuously evolve your application
- Work closely with Four Js support
- Use Professional Services if you require extra resources



Thank You

Informix Tech Talks by the IIUG on YouTube

We have launched a new channel on YouTube for Informix Users! Please subscribe to our channel on YouTube to stay informed. This will be a place for Informix how-to videos.

Subscribe at:

<https://www.youtube.com/c/InformixTechTalksbytheIIUG>

