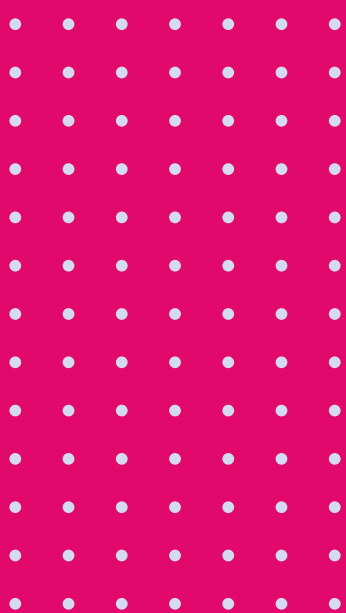




An Experiment on the Use of Altair SLC for Clinical Study Analytics

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TT03 PHUSE EU Connect 2024



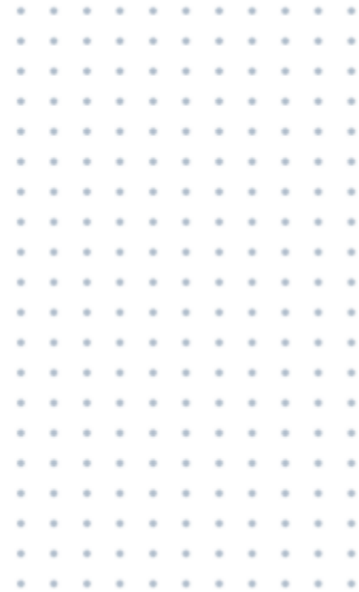
1. Objectives

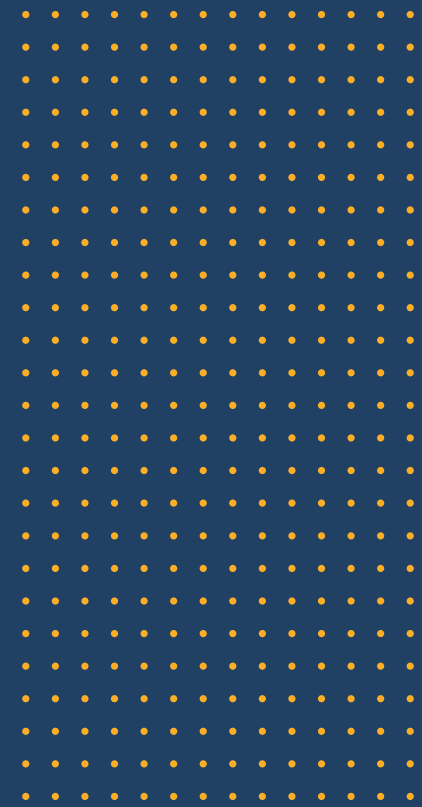
2. What is SLC

3. Evaluation 1: Analysis

4. Evaluation 2: Execution

5. Conclusion



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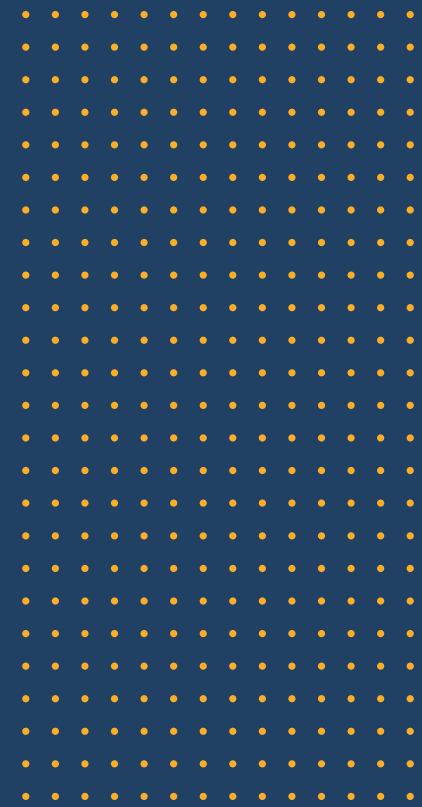
Objectives

Objective

- How well does SLC work as the engine for execution of SAS Language programs, within the Veramed Statistical Computing Environment
- What adjustment (if any) will need to be made to current technical components
- Could SLC be used on its own for clinical reporting in utilising the SAS language
- Two primary components

Program
Analysis

Program
Execution
(and adaptation)

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What is SLC

Background

- SLC = SAS Language Compiler
- Analytics platform to directly run programs written in the SAS language
- Can also support Python / R / SQL
 - (Not evaluated by Veramed)
- Brief history
 - Formerly known as “World Programming System”
 - In existence for over 20 years

SLC Primary Components



Altair Analytics Workbench™

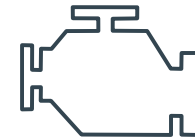


User Interface

- Based on Eclipse IDE
- Writing / submitting SAS Language programs
- Alternative web-based IDE
 - (not evaluated by Veramed)



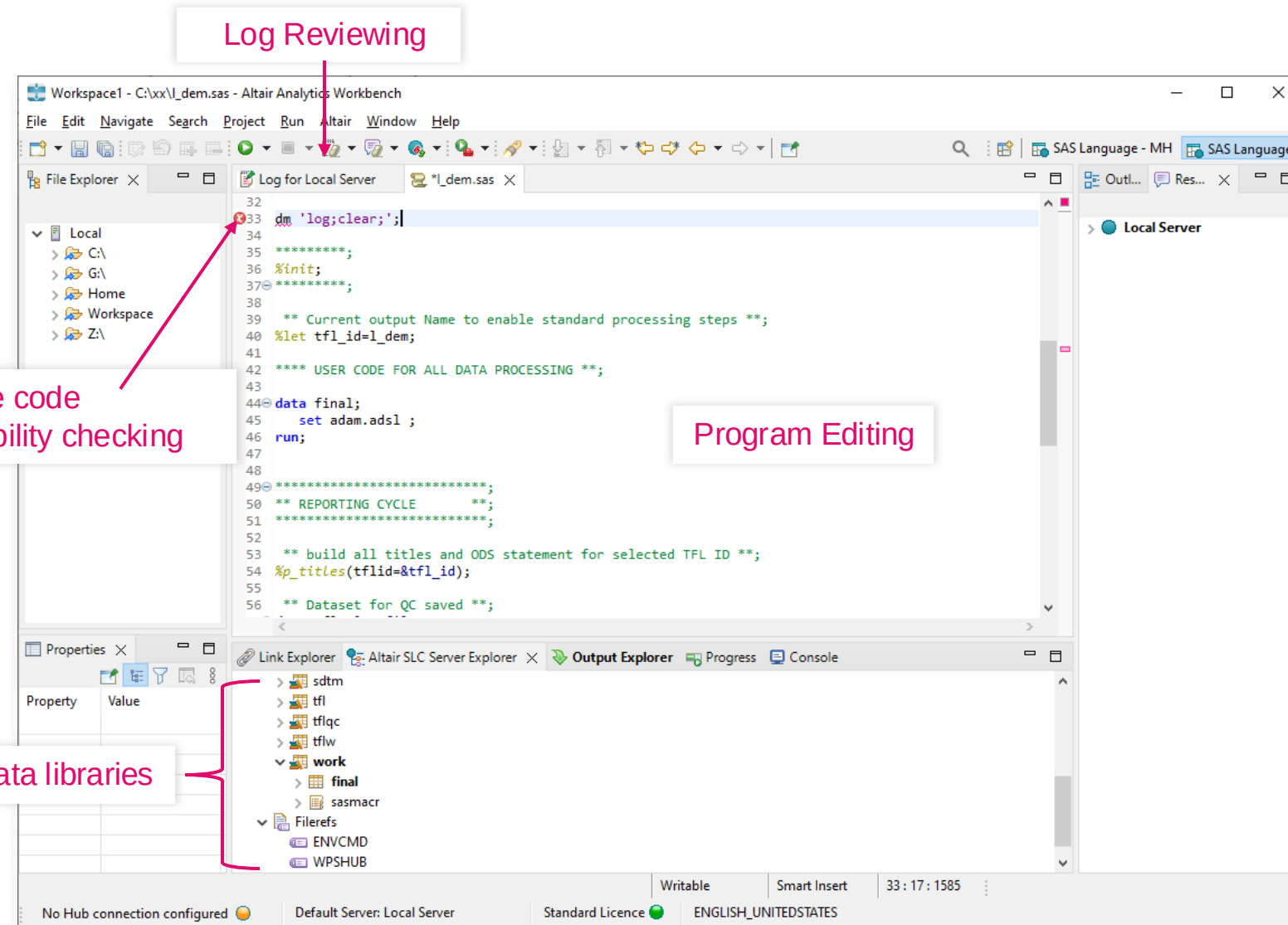
Altair SLC™



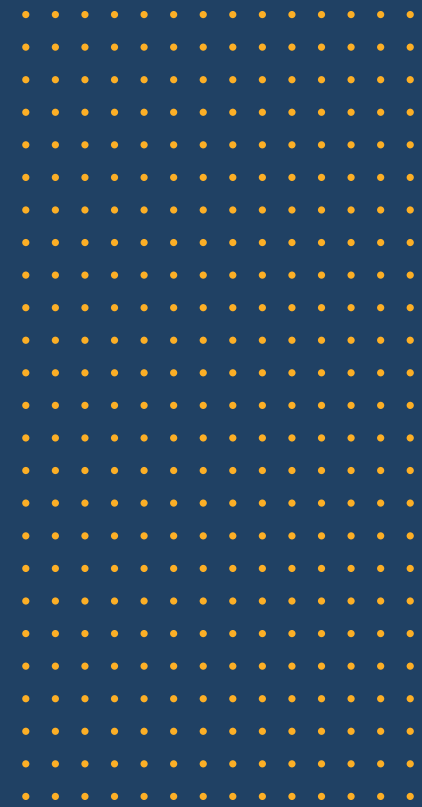
SLC Engine

- All code execution
- Local machine installation or
- Remote server installation

Altair Analytics Workbench™



- Reset engine / settings without restarting app
- Visual workflow platform

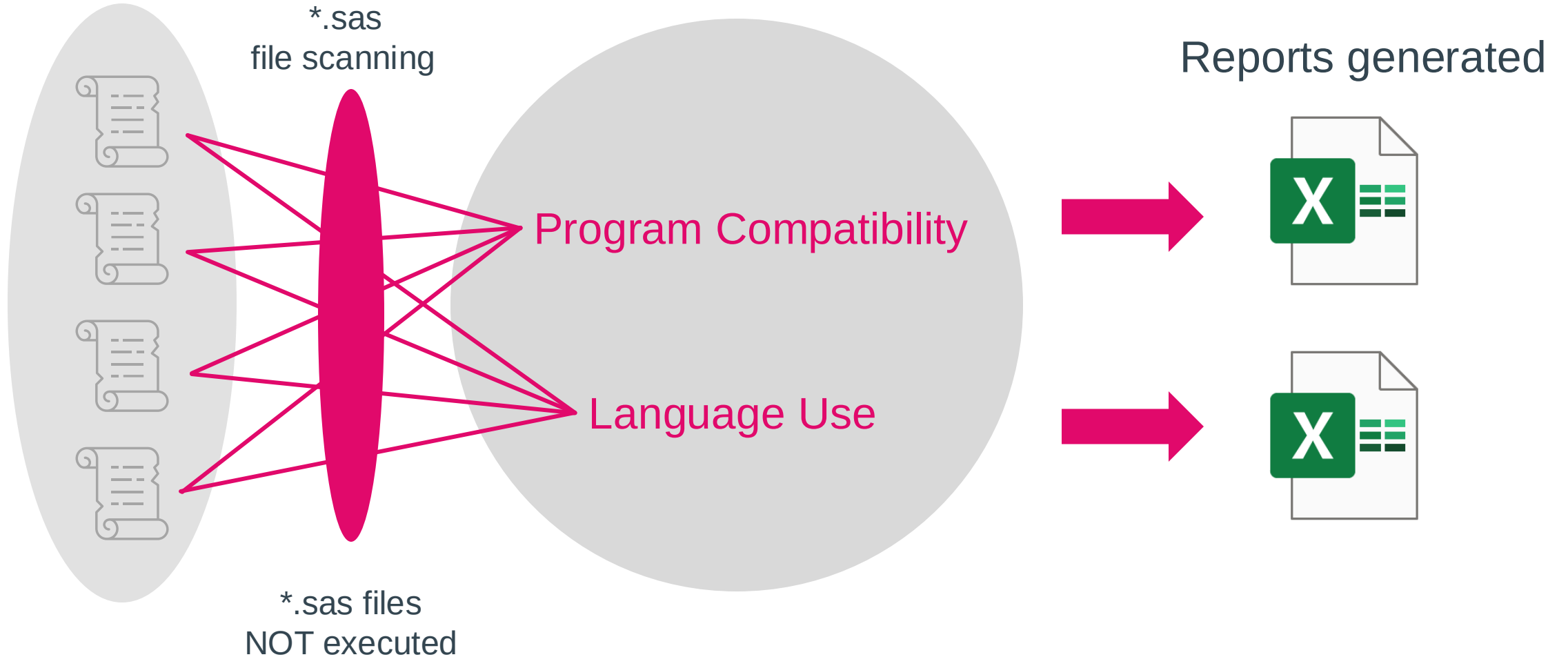
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Evaluation Part 1:

Analysis of Programs

Program Analysis

Via Altair Analytics Workbench



Program Compatibility

Summary

Program Compatibility Summary	
Spreadsheet produced by Altair Analytics Workbench™ program analyser version 5.24.5.39	
Please note that due to the nature of the SAS language it is not possible to guarantee these static analysis results are 100% accurate	
Distinct Problems	99
Individual Problems	55
Source files analysed	1000
Ignored files	23
Analysed files with problems	24
Analysed files without problems	976
Unsupported procedure statements	1
Unsupported procedure options	2
Unsupported DATA step functions	3
Unsupported DATA step statements	4
Unsupported ODS destinations	5
Unsupported call routines	6
Unsupported DATA step options	7
Unsupported macro statements	8
Unsupported system options	9
Unsupported procedures	10

Category Breakdown

Category	Language Element	Status	Count
Procedure option	B option on PROC COMPARE	Unsupported	24
DATA step function	MISING	Unsupported	3
DATA step statement	QSTESTCD statement of DATA	Unsupported	1
DATA statement option	LENGTH option on DATA	Unsupported	15
System option	RANDOMISATION	Unsupported	1
System option	PRIMARY	Unsupported	1
System option	ANALYSIS	Unsupported	1
System option	USES	Unsupported	1
System option	NOPDFACCESS	Unsupported	7
System option	OPTIONS	Unsupported	12
System option	DSOPTIONS	Unsupported	4
Procedure	XSL	Unsupported	16
Procedure	FONTREG	Unsupported	11
Procedure	SEQTEST	Unsupported	2
Procedure	SURVEYREG	Unsupported	8
Procedure	PRTINTO	Unsupported	2
Procedure	BOB	Unsupported	4

Detail

Category	Language Element	Status	Program Name	Line Number
Procedure option	B option on PROC COMPARE	Unknown	Z:\C666\Altair\ALT_SLC_CONS_SOW001'	89
Procedure option	B option on PROC COMPARE	Unknown	Z:\C666\Altair\ALT_SLC_CONS_SOW001'	95
Procedure option	B option on PROC COMPARE	Unknown	Z:\C666\Altair\ALT_SLC_CONS_SOW001'	55
Procedure option	B option on PROC COMPARE	Unknown	Z:\C666\Altair\ALT_SLC_CONS_SOW001'	57
Procedure option	OUTDIFF option on PROC COMPARE	Unknown	Z:\C666\Altair\ALT_SLC_CONS_SOW001'	138

Language Use

Procedures

Data Steps

ODS

Dataset options

System options

Call routines

Functions

Function	Count	First Reference Location
COMPRESS	104	Z:\C666\Altair\ALT_SLC_CONS_SO
EXIST	54	Z:\C666\Altair\ALT_SLC_CONS_SO
FILEREF	9	Z:\C666\Altair\ALT_SLC_CONS_SO
FIND	50	Z:\C666\Altair\ALT_SLC_CONS_SO
GETOPTION	217	Z:\C666\Altair\ALT_SLC_CONS_SO
INDEX	117	Z:\C666\Altair\ALT_SLC_CONS_SO
INPUT	218	Z:\C666\Altair\ALT_SLC_CONS_SO
LEFT	80	Z:\C666\Altair\ALT_SLC_CONS_SO
LENGTH	93	Z:\C666\Altair\ALT_SLC_CONS_SO
MISING	3	Z:\C666\Altair\ALT_SLC_CONS_SO
MISSING	132	Z:\C666\Altair\ALT_SLC_CONS_SO

Example incompatibilities flagged

Unsupported Procedures

- PROC XSL

Missing Aliases

- Proc Compare
 - B= (base)
 - OUTDIFF (outdif)

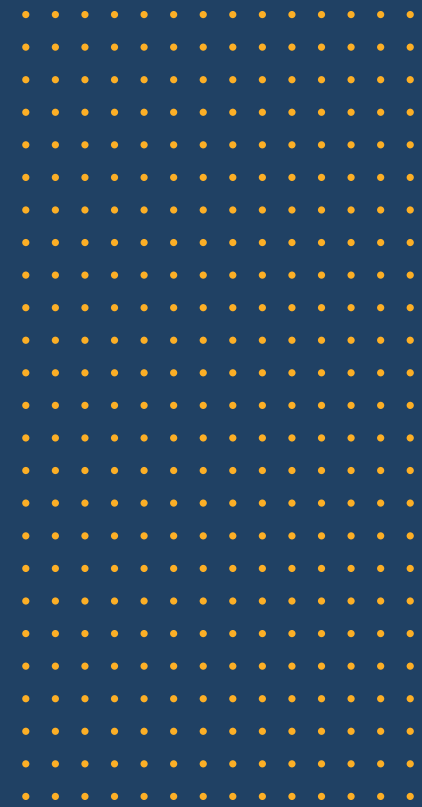
Flagged issue

- 'DM' statements

False positive

- Unresolved macro syntax

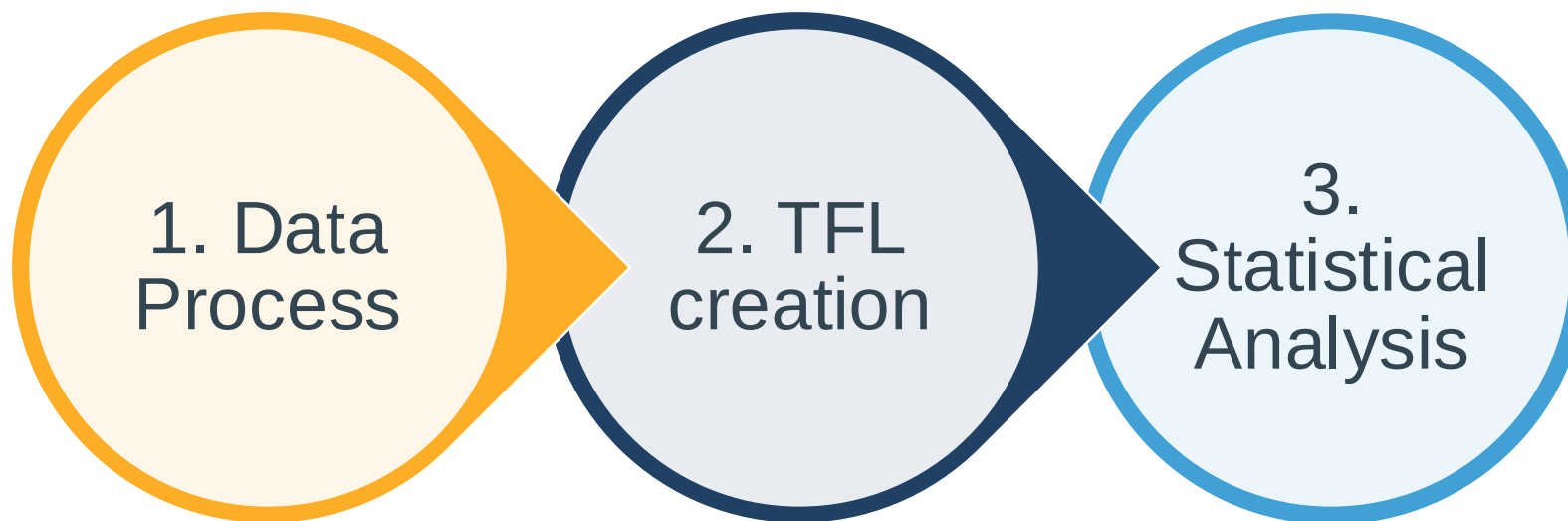
- Omissions raised directly with Altair for development

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Evaluation Part 2:

Execution of Programs

Program Execution



Based on internal dummy study, using CDISC data following Veramed internal programming standards / processes

1. Data Processing

- Central Configuration changes (no user code changes)
 - SLC default datasets create - *.WPD
 - **Config.sas**: -ENGINE SAS7BDAT
 - SLC default XPT file create = V8
 - **Autoexec.sas**: OPTIONS XPORTVERSION=5;
- Syntax change (only user code change needed)
 - Use of format **e8601dt**.
 - SLC expects “**seconds**” to be present in the source xxDTC Variable. Data omitted these
 - Work around – runtime concatenation of “:00”

Data Processing – Results Summary

Adaptation
needed

Nominal changes needed to enable code to fully execute in SLC

Overall
result

Numeric accuracy: SLC resulting data (*.sas7bdat) matched baseline copy after limited syntax adjustment

2. TFL creation

- PROC TEMPLATE style
 - Re-created from scratch. All elements / attributes contained in single program.
 - No inheritance of style
- TITLES

```
title1 "Veramed on SLC";
title3 "Protocol C999-123";
```

Veramed on SLC
Protocol C999-123

- RTF Rendition

```
footnote1 j=r "Page |{thispage} of |{lastpage}"
```

Page 1 of 2

Veramed on SLC
Protocol C999-123

Missing space

Page1 of 2

```
title1 "Veramed on SLC";
title2;
title3 "Protocol C999-123";
```

Space added

```
footnote1 j=r "Page |{thispage} of |{lastpage}"
```

Original code

Expected outcome

Actual outcome

Code workaround

TFL creation

Listing headers. Not repeating.

Listing of Demography

Subject ID.	Description of Planned Arm	Sex	Age	Race	Ethnicity	Baseline Height (cm)	Baseline Weight (kg)	Pooled Baseline BMI Group 1
01-701-1015	Placebo	F	63	WHITE	HISPANIC OR LATINO	147.32	54.43	25-<30
01-701-1023	Placebo	M	64	WHITE	HISPANIC OR LATINO	162.56	80.29	>=30
01-701-1028	Xanomeline	M	71	WHITE	NOT HISPANIC OR LATINO	177.8	99.34	>=30

Page 1

Listing of Demography

01-701-1211	Xanomeline Low Dose	F	76	WHITE	AMERICAN LATINO	160.02	45.36	<25
01-701-1234	Placebo	M	69	WHITE	NOT HISPANIC OR LATINO	181.61	77.11	<25
01-701-1239	Xanomeline	M	56	WHITE	HISPANIC OR LATINO	168.91	95.94	>=30

Page 2

Simple fix with BREAK Statement and page variable To enable repeat headers

Listing of Demography

Subject ID.	Description of Planned Arm	Sex	Age	Race	Ethnicity	Baseline Height (cm)	Baseline Weight (kg)	Pooled Baseline BMI Group 1
01-701-1192	Xanomeline Low Dose	F	80	WHITE	NOT HISPANIC OR LATINO	151.13	63.5	25-<30
01-701-1203	Placebo	F	81	BLACK OR AFRICAN AMERICAN	NOT HISPANIC OR LATINO	160.02	66.23	25-<30
01-701-1211	Xanomeline	F	76	WHITE	AMERICAN LATINO	160.02	45.36	<25

All raised with Altair. System updates in progress to refine combability and negate the need for alternatives

Protocol: VERA-C999

Page 1 of 1

Population: Intent-to-treat

Test: DUMMY Rand List / Data Cut: DDMMYYYY

Table 1.1.1

Summary of Demographic and Baseline Characteristics

Variable	Statistic	Placebo N=86	Xanomeline Low Dose N=84	Xanomeline High Dose N=84
Age (years)	n	86	84	84
	Mean	75.2	75.7	74.4
	SD	8.59	8.29	7.89
	Median	76.0	77.5	76.0
	Min	52	51	56
	Max	89	88	88
Age group (years)				
	<65	14 (16.3)	8 (9.5)	11 (13.1)
	65-80	42 (48.8)	47 (56.0)	55 (65.5)
>80	n (%)	30 (34.9)	29 (34.5)	18 (21.4)
Sex				
	F	53 (61.6)	50 (59.5)	40 (47.6)
M	n (%)	33 (38.4)	34 (40.5)	44 (52.4)
Baseline height (cm)	n	86	84	84
	Mean	162.6	163.4	165.8
	SD	11.52	10.42	10.13
	Median	162.6	162.6	165.1
	Min	137	136	146
	Max	185	196	191
Baseline weight (kg)	n	86	83	84
	Mean	62.8	67.3	70.0
	SD	12.77	14.13	14.65
	Median	60.6	64.9	69.2
	Min	34	45	42
	Max	86	106	108

TFL (output / Data) - Results Summary

Adaptation
needed

Style / Layout: A number of changes needed to generate required visual results in SLC

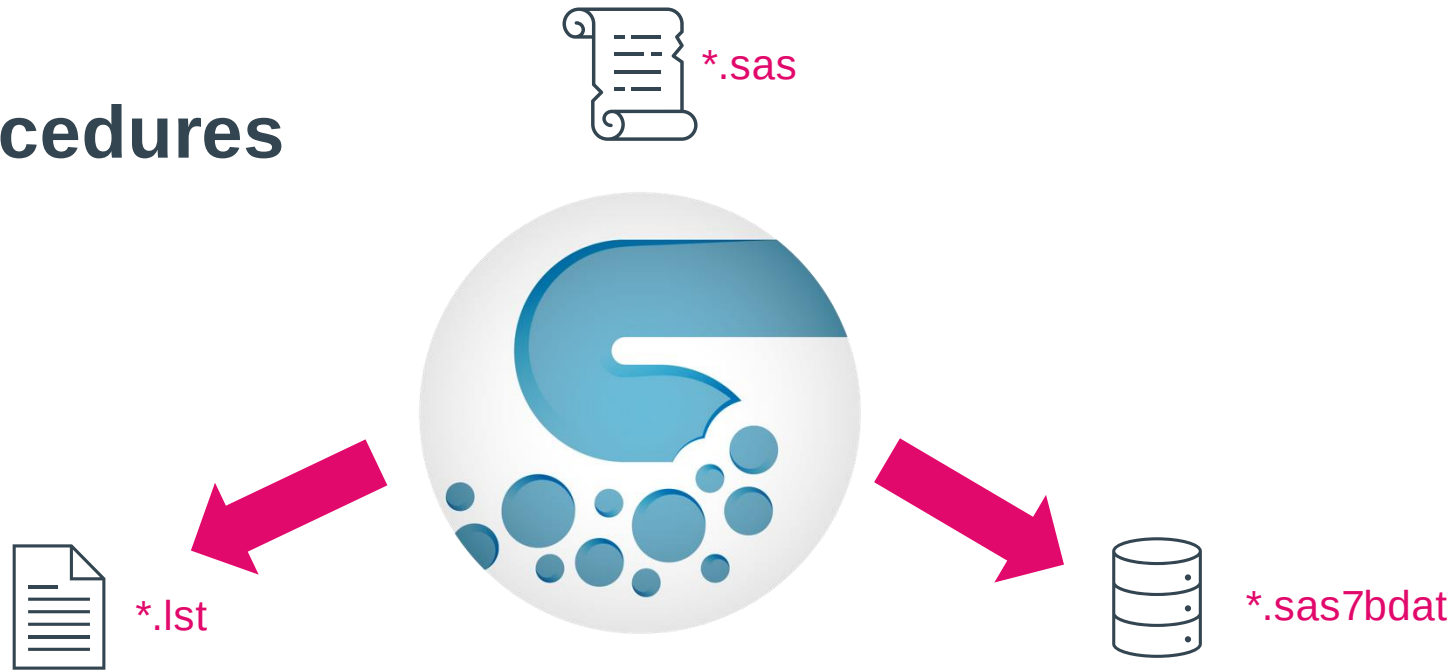
Overall result

Style / Layout: After adaptation, TFLs generated are certainly suitable for CSR
Numeric accuracy: Resulting TFL datasets from SLC matched our baseline stored data, confirming results are accurate

3. Statistical Procedures

- Bespoke programs to check multiple statistical procedure.
- Statistician given free roam to write programs, focusing on:
 - PROC MIXED
 - PROC LOGISTIC
 - PROC PHREG
 - PROC LIFETEST
 - PROC MI
 - PROC GENMOD
 - PROC TTEST
 - PROC GLIMMIX
 - PROC QUANTREG
 - PROC MIANALYZE
- Written without prior knowledge of any SLC functionality.

Statistical Procedures



- Numeric results matched across verbose output
- Subtle sig-digit differences. Rounding 6th/7th figure
- Parity in results*

- ODS datasets created as expected
- Selected subtle differences in dataset attribute (variable names / labels)
- One example datasets of different structure
- Parity in results*

* - there was one T-Test result where the result generated by SLC was “1 minus the expected Value”
This has already been addressed by Altair and correction imminent

Statistical Procedures – additional results

- Results
 - Single difference identified
 - PROC TTEST. Non-inferiority test result. 1- “expected answer”
 - Fix ongoing
- Currently unsupported (as of November 2024)
 - ODDSRATIO (tested in PROC LOGISTIC / PROC GLIMMIX)
 - PROC PHREG – TIES=EXACT option on MODEL statement
 - PROC LOGISTIC – FIRTH option on MODEL statement

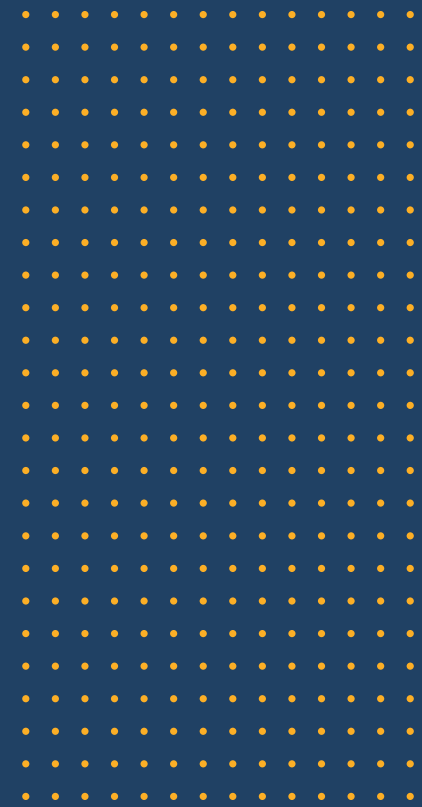
Statistical Procedures – Results Summary

Adaptation
needed

Some items unsupported (currently):
Output numbers / slight difference in number of
sig digits
Output datasets. Properties slight change

Overall result

Numeric accuracy:
Results match expected



Conclusion

Conclusions

What current use case could SLC be deployed into:

To support execution of legacy programs

Migration needed:

- Expectation is that at this time legacy programs would need editing to execute successfully and create expected results

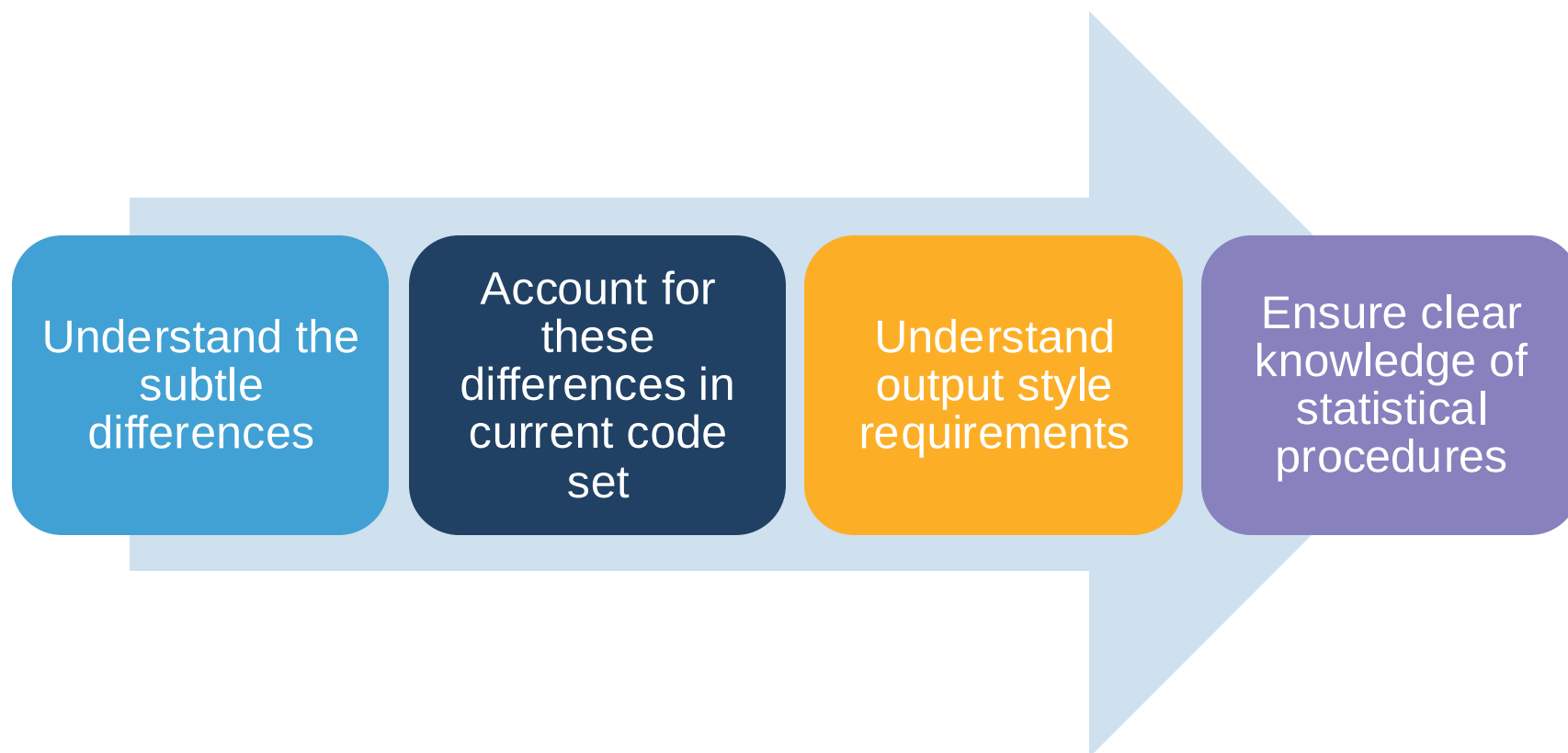
To support new study deliveries

Yes:

- Once pre-investigation of gaps understood, and planned accordingly, SLC could be used as primary s/w for delivery

Conclusions

Detailed migration planning / assessment would be key.



Thank you

Questions?

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