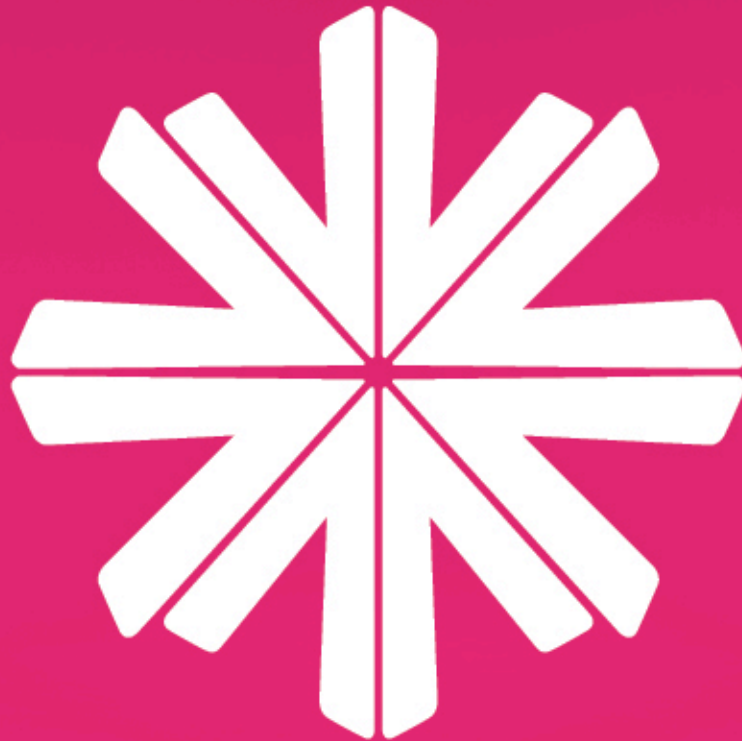


THE FUTURE OF
CLINICAL DEVELOPMENT



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PhUSE 2016 - Barcelona

SAS Environment Upgrade – The PRA Experience

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SAS Environment Upgrade

Agenda

- Rationale for change
- Components of solution
 - SAS GRID architecture
 - 64-bit processing
 - SAS 9.4 configuration
 - UTF-8 encoding
 - SAS Enterprise Guide
- Points for consideration
- Conclusions

Rationale for Change

Existing System

- SAS v9.1.3
- Remote Desktop Connection
- Windows style user interface
- 32-bit processor
- WLATIN1 character encoding dataset

Rationale for Change

Two Main Drivers:

1. Increased Performance

- Higher resource utilization
- Reduced costs of ownership

2. Scalability

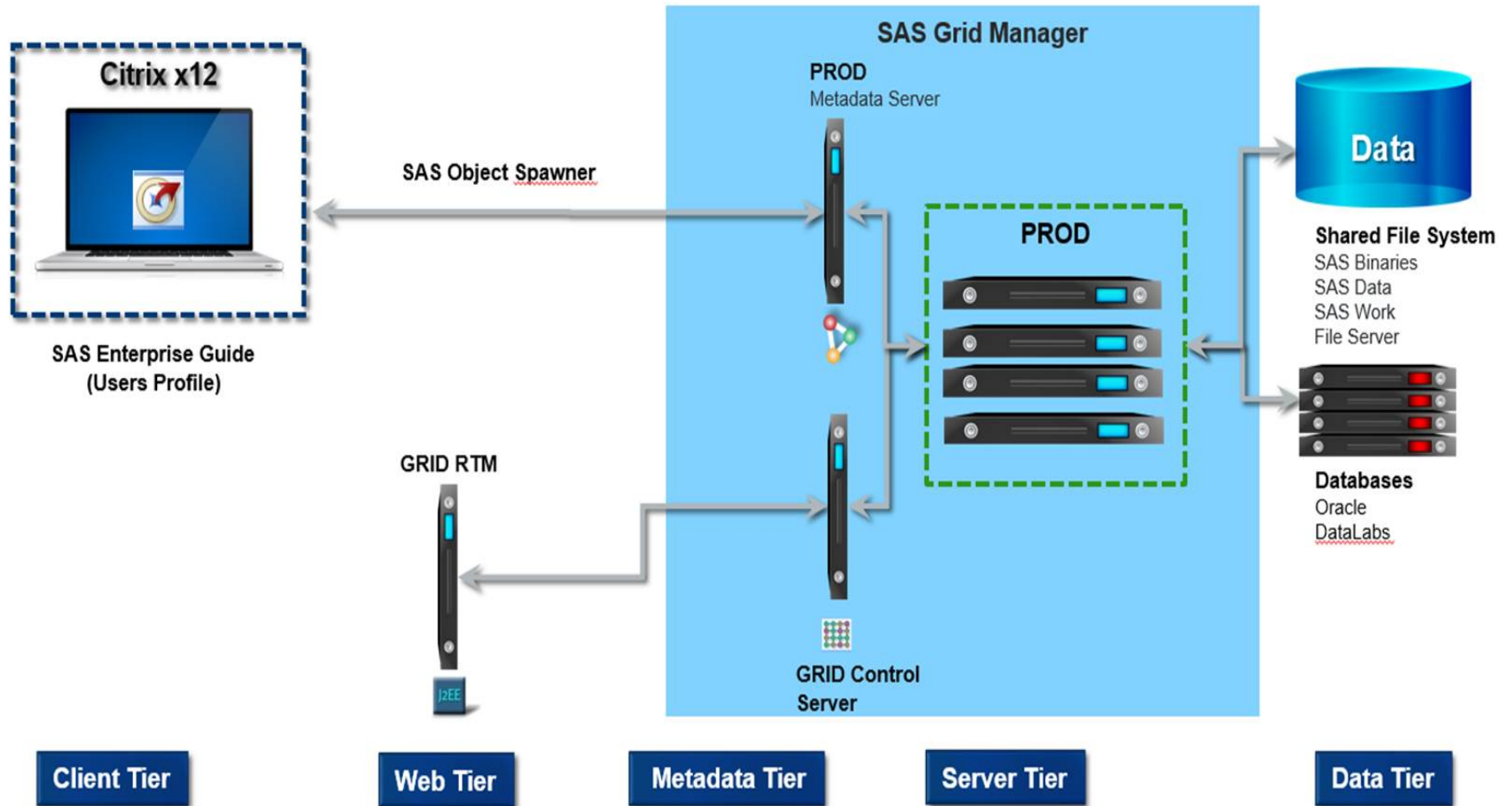
- Flexibility to incrementally grow as our data and processing needs grew in the future.

Rationale for Change

Solution – Upgrade of components

- SAS v9.1.3 → SAS v9.4
- Remote Desktop Connection → SAS GRID
- Windows style user interface → SAS EG
- 32-bit processor → 64-bit Processor
- WLATIN1 character encoding → UTF-8 encoding

PRA PROD SAS GRID ARCHITECTURE



64-bit Processing

- Upgrading to a 64-bit system greatly increases the amount of memory the CPU can use
 - 64-bit processor is capable of using 4 billion times as much memory than a 32-bit processor
- Benefits include:
 - Greater memory utilization offering greater processing speed.
 - Much improved resolution in graphics.
 - Matches the MS office products such as MS Word we were already running on a 64-bit system.

SAS 9.4

- Backward compatibility issues from SAS 9.4 to SAS 9.1.3.
- An internal analysis found that prior versions of SAS could not read our datasets produced by SAS 9.4.
- Programs were no problem providing they did not use the new functionality of SAS 9.4 since they are merely text files.
- EXTENDOBSCOUNTER defaulted to YES in SAS 9.4
- Had to be set explicitly in Global Autoexec to NO

UTF-8 Encoding

- The UTF-8 character is a very broad character set containing over 100,000 printable characters compare to 256 in WLATIN1.
- WLATIN1 is commonly used by our clients.
- WLATIN1 is a single-byte encoding character dataset. This means one character is 1 byte. In UTF-8 one character can be 1 byte, 2 bytes, 3 bytes, or even 4 bytes.

UTF-8 Encoding

- Any SAS function which computes a length counts the number of bytes. This suits WLATIN1 encoded data.
- To resolve issues that these string functions can cause for multi-byte data, SAS provides a set of string functions, called K functions.
- A K Function however counts the number of characters. The K Functions are simply the normal SAS function preceded with a K. i.e. KLENGTH, KSTRIP, KLEFT, KCOMPRESS etc.

UTF-8 Encoding

Most of the SAS functions which process a length exist as K functions and can be replaced to prevent such issues.

SAS Enterprise Guide (Version 6.1) has a tool which can look through code for such KFUNCTION issues

UTF-8 Encoding

raw_ae ▾

Program

Save ▾ Run ▾ Stop ▾ Selected Server: SASApp_PRD (Connected) ▾ Analyze Program ▾ Export ▾ Send To ▾ Create ▾ Properties

Analyze for Internationalization

This will analyze your SAS program for internationalization (I18N) and Unicode compliance.

Analyze

Options

☐ Check for embedded strings (EMS) ☒ Check for string functions (IFN)

☐ Check for concatenation of strings (CON) ☐ Check for string macros (IMA)

☐ Check for locale-dependent SAS formats/informats (LFM) ☐ Check for Unicode problems with column pointer controls (UPS)

Message Type	Line	Affected Code	Suggested Substitution
IFN (Non-I18N string function)	154	upcase	KUPCASE
IFN (Non-I18N string function)	155	upcase	KUPCASE
IFN (Non-I18N string function)	156	upcase	KUPCASE
IFN (Non-I18N string function)	159	upcase	KUPCASE
IFN (Non-I18N string function)	160	upcase	KUPCASE
IFN (Non-I18N string function)	165	upcase	KUPCASE
IFN (Non-I18N string function)	166	upcase	KUPCASE
IFN (Non-I18N string function)	169	upcase	KUPCASE
IFN (Non-I18N string function)	170	upcase	KUPCASE
IFN (Non-I18N string function)	171	upcase	KUPCASE
IFN (Non-I18N string function)	174	upcase	KUPCASE
IFN (Non-I18N string function)	175	upcase	KUPCASE
IFN (Non-I18N string function)	251	strip	KSTRIP
IFN (Non-I18N string function)	251	upcase	KUPCASE
IFN (Non-I18N string function)	282	index	KINDEX/KINDEXB

Insert Substitution Suppress Next Substitution Close

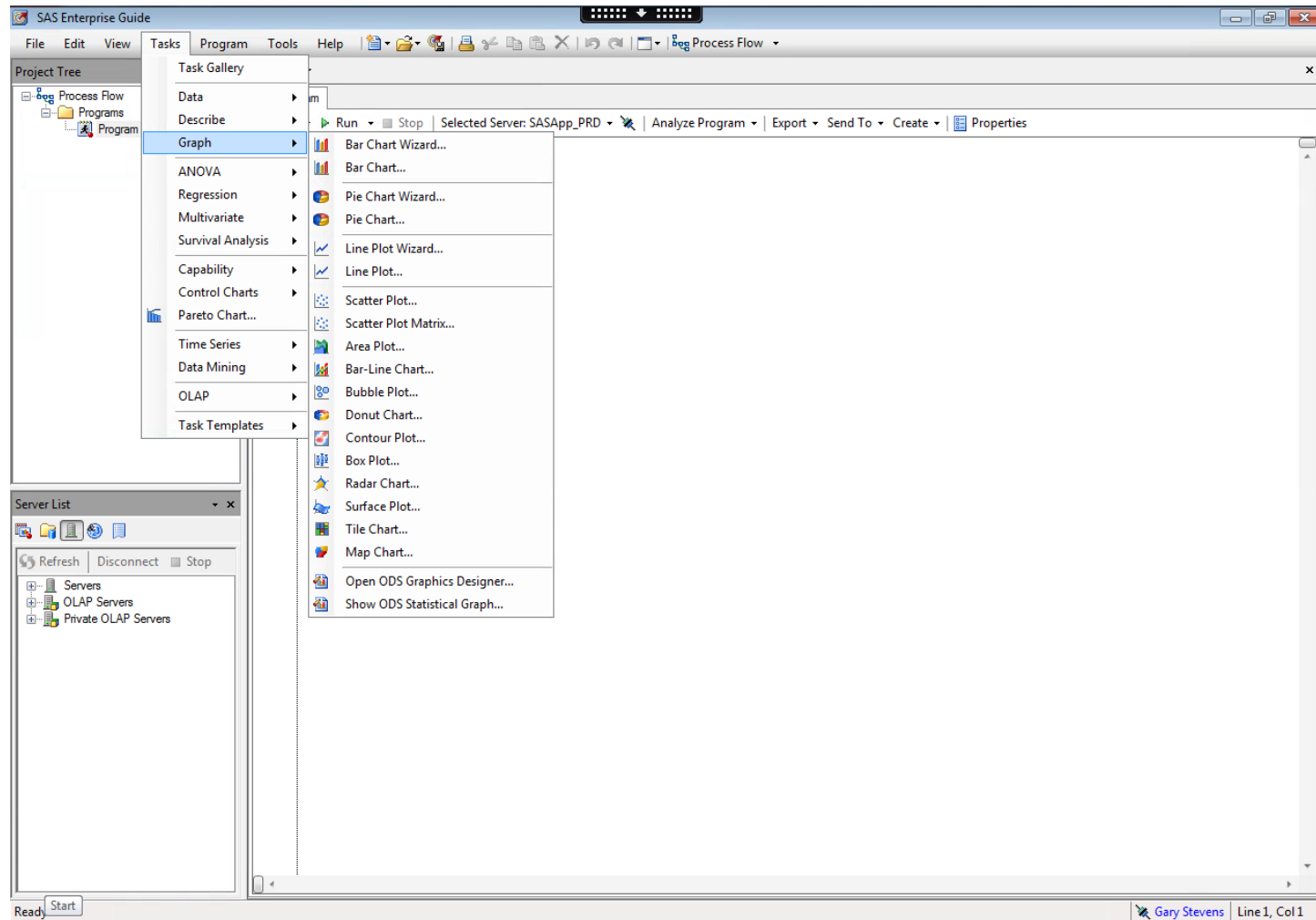
Ready

```

148     else if upcase(aeacn1)="DRUG PERMANENTLY DISCONTINUED" then aeacn="4";
149     else if upcase(aeacn1)="NOT APPLICABLE" then aeacn="98";
150
151     **AEOUT;
152     if upcase(aeout1)="RECOVERED/RESOLVED" then aeout="0";
153     else if upcase(aeout1)="RECOVERING/RESOLVING" then aeout="1";
154     else if upcase(aeout1)="RECOVERED/RESOLVED WITH SEQUELAE" then aeout="2";

```

SAS Enterprise Guide

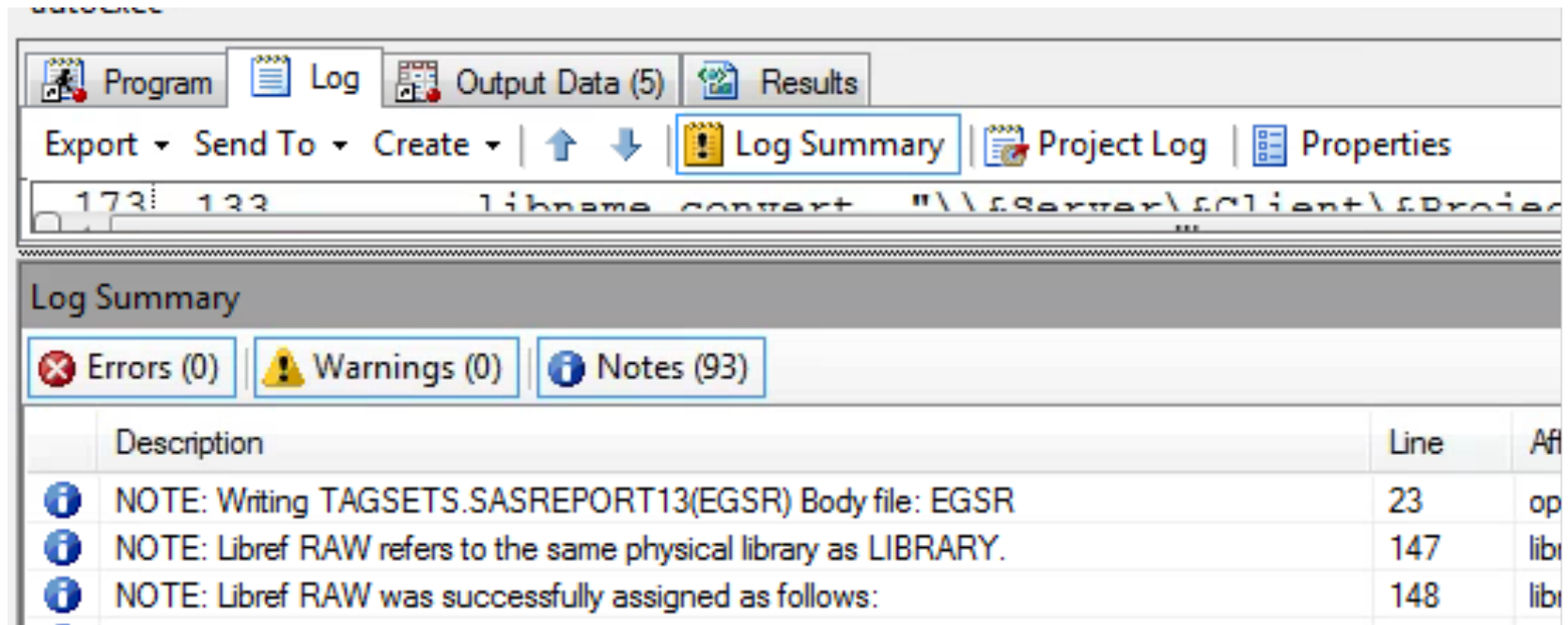


SAS Enterprise Guide

SAS bill SAS Enterprise Guide as a point-and-click, menu- and wizard-driven tool that empowers users to analyze data and publish results.

PRA however, simply uses SAS EG as a coding environment. There are however some features of SAS EG which PRA does use, such as the log summary which will analyze the log of a run program for errors or warnings.

SAS Enterprise Guide



The screenshot shows the SAS Enterprise Guide interface. At the top, there are tabs for Program, Log, Output Data (5), and Results. Below these are buttons for Export, Send To, Create, and Log Summary (which is highlighted with a blue box). Other buttons include Project Log and Properties. A code editor window is visible in the background with the text: `libname convert "\\fServer\client\Project`. The Log Summary window is open, showing a summary of log messages. It has three tabs: Errors (0), Warnings (0), and Notes (93). The Notes tab is selected, showing a list of log messages with columns for Description, Line, and Affected.

Description	Line	Aff
NOTE: Writing TAGSETS.SASREPORT13(EGSR) Body file: EGSR	23	op
NOTE: Libref RAW refers to the same physical library as LIBRARY.	147	lib
NOTE: Libref RAW was successfully assigned as follows:	148	lib

Considerations

- Training users on new system
 - Access to GRID
 - SAS Enterprise Guide
 - How to deal with encoding
- Seamless Transition
- Dissemination of upgrade information to Client

Conclusions

- The process of migrating and adopting the new SAS environment took a little longer than we originally expected due to unforeseen technical issues. Once these were overcome, all projects were migrated in separate waves over a period of a few months to the new system
- Users and studies are now fully transitioned to the new set-up, with users appreciating greater system stability and performance.
- As our clients upgrade to a similar set up, with regard to SAS version and encoding, we can begin to implement some of the new functionality we found when initially looking through SAS 9.4 documentation.

QUESTIONS ?

CONTACT INFORMATION

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