SAS 9 Update – New Functionalities for SAS Programmers

Featuring:

PROC FCMP, Hash Object, Using Java/C in SAS, ODS Graphics Designer, Enterprise Guide

PhUSE Day, 4th of May, Frankfurt
Gregor Herrmann
SAS Germany

SAS 9 Update
New Functionalities for SAS Programmers

- User defined functions
- External functions
- Java Object
- DATA Step Hash Object
- ODS Graphics Designer
- Enterprise Guide

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The FCMP Procedure
User defined functions

- Enables programmers to create and test SAS functions and subroutines using DATA step syntax
- Enables programmers to store these functions in a package within a SAS data set
- Enables programmers to more easily read, write, and maintain complex code with independent and reusable subroutines.
- Functions and subroutines can be referenced anywhere where SAS normally allows functions to be used (DATA step, WHERE statements, etc.)

Advantages of PROC FCMP

- The advantages of using the FCMP procedure include the following:
  - A library of reusable routines can be built using DATA step syntax. Routines can be reused in any SAS program that has access to their storage locations.
  - Complex programs can be simplified by abstracting common computations into named program units. FCMP routines enable programmers to read, write, and maintain complex code easily.
  - FCMP routines are independent from their use because any program that calls a routine is not affected by the routine's implementation.

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The FCMP Procedure
A simple Example

Creating a Function

```
proc FCMP outlib = sasuser.funcs.trial;
  function Study_Day(intervention_date, event_date);
     If event_date < intervention_date then
       return(event_date - intervention_date);
     else
       return(event_date - intervention_date + 1);
  endsub;
run;
```

Calling a Function

```
options cmplib = sasuser.funcs;
data _null_;
    start = '15Feb2006'd;
    today = '27Mar2006'd;
    sd = study_day(start, today);
    put sd=;
run;
```

Returned value for sd was 41

```
152  Options cmplib = sasuser.funcs;
153          Data _null_;
154          start = '15Feb2006'd;
155          today = '27Mar2006'd;
156          sd = study_day(start, today);
157
158          put sd=;
159       Run;

sd=41
NOTE: DATA statement used (Total process time):
      real time           0.06 seconds
      cpu time            0.04 seconds
```

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The PROTO Procedure
External Functions

- PROC PROTO enables you to register, in batch mode, external functions that are written in the C or C++ programming languages.

PROC PROTO PACKAGE=catalog-entry <option(s)>;

MAPMISS type1=value1 type2=value2 ...;

LINK load-module;

MAPMISS- Specify alternative values, by type, to pass to functions if values are missing.

LINK- Specify the name, path, and load module that contains your functions.

PROC PROTO Example

This example shows how to use PROC PROTO to prototype two external C language functions called SPLIT and CASHFLOW. These functions are contained in the shared library that is specified by the LINK statement.

```
proc proto package = sasuser.myfuncs.mathfun

    label = "package of math functions";

    link "math.dll";

    int split(int x "number to split")
        label = "splitter function";

    int cashflow(double amt,
                 double rate,
                 int periods,
                 double * flows / iotype=0)
        label = "cash flow function";

    run;
```

PROC PROTO Example

```
proc fcmp libname=sasuser.myfuncs;
   array flows[20];
   a = split(32);
   put a;
   b = cashflow(1000, .07, 20, flows);
   put b;
   put flows
```

Output: Listing

Output from the SPLIT and CASHFLOW Functions

```
                                    The SAS System                          1

                                  The FCMP Procedure

  16
  12
  70 105 128.33333333 145.83333333 159.83333333 171.5 181.5 190.25 198.02777778 205.02777778
  211.39141414 217.22474747 222.60936286 227.60936286 232.27602953 236.65102953 240.76867658
  244.65756547 248.341776 251.841776
```

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Using the Java Object

```
data _null_;
  length return $ 40;
  declare javaobj myPro ("java.lang.System");
  declare javaobj myDate ("java.util.Date");

  myPro.callStaticStringMethod("getProperty", "java.version", return);
  javaVersion = return;
  putlog "NOTE: Java Version = " return;

  myPro.callStaticStringMethod("getProperty", "user.name", return);
  userName = return;
  putlog "NOTE: User Name = " return;

  myPro.delete();
  myDate.delete();
run;
```

```
2180
2181    myPro.delete( );
2182    myDate.delete( );
2183  run;

NOTE: Java Version = 1.5.0_12
NOTE: User Name = schhrp
NOTE: DATA statement used (Total process time):
      real time               0.03 seconds
      user cpu time           0.00 seconds
      system cpu time         0.00 seconds
      Memory                                172k
      OS Memory                             14192k
      Timestamp               9/29/2010  2:26:22 PM
```

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The DATA step hash object

- The DATA step hash object is one of the most versatile new features of Base SAS programming.
  - reduced data processing time for complex data join operations like looking up or modifying values from one data set in another data set
  - a fast, easy way to perform in-memory table lookups without sorting or indexing
- With SAS 9.2, we introduce the ability to store duplicate keys in a hash object
  - The hash object can now function as an in-memory index, a sort heap, or even a general-purpose list object.
- The hash object allocates memory as needed. There is no need to pre-size the hash object.

The DATA step hash object in SAS 9.2

- New initialization options
  - duplicate: ‘replace’ | ‘error’
  - multidata: ‘y’ | ‘n’
- More graceful memory management
  - DEFINEDONE(memrc: ‘y’)
- New methods for handling multiple data values
  - HAS_NEXT / HAS_PREV
  - FIND_NEXT / FIND_PREV

The DATA step hash object with multiple values

```
data visits;
   attrib patient length=8 visit length=8 informat=date. format=date.;
   input patient visit @@;
   datalines;
1 26MAR08 2 26MAR08 1 28MAR08 3 27MAR08 2 27MAR08
2 28MAR08 3 31MAR08 5 31MAR08 1 31MAR08 4 01APR08
;
data _null_;
   length r 8;
   dcl hash h(dataset:'visits', multidata: 'y');
   h.definekey('patient');
   h.definedata('patient', 'visit');
   rc = h.definedone(memrc: 'y');
   if (rc ^= 0) then do;
      h.delete();
      stop;
      end;
   call missing (patient, visit);
   do patient = 1 to 5;
      rc = h.find();
      if (rc = 0) then do;
         put patient=  @15 visit= date.;
         h.has_next(result: r);
         do while(r ne 0);
            rc = h.find_next();
            put 'dup ' patient= @15 visit= date.;
            h.has_next(result: r);
         end;
      end;
   end;
   run;
```

SAS Log:

```
patient=1     visit=26MAR08
dup patient=1 visit=31MAR08
dup patient=1 visit=28MAR08
patient=2     visit=26MAR08
dup patient=2 visit=28MAR08
dup patient=2 visit=27MAR08
patient=3     visit=27MAR08
dup patient=3 visit=31MAR08
patient=4     visit=01APR08
patient=5     visit=31MAR08
```

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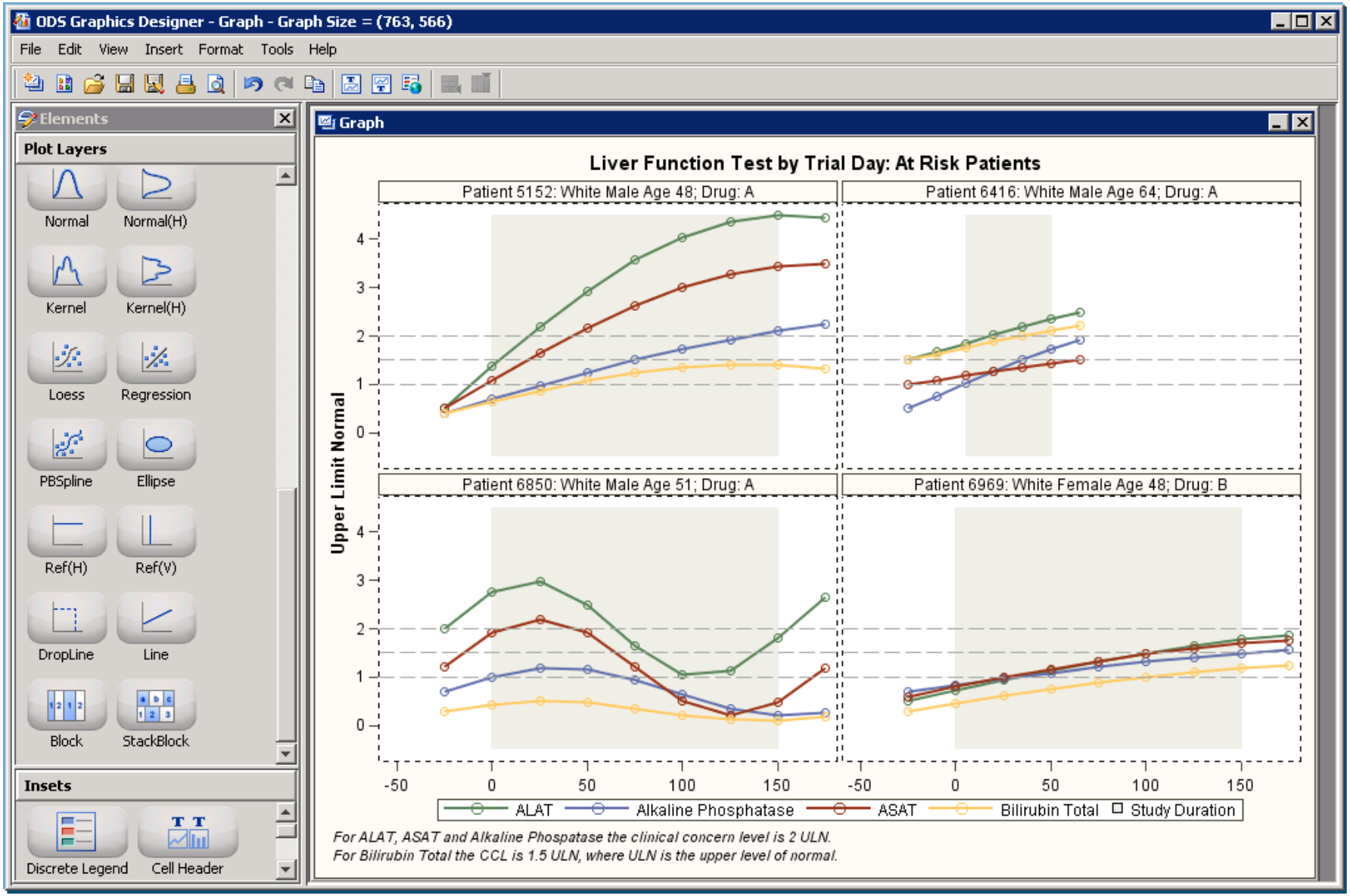
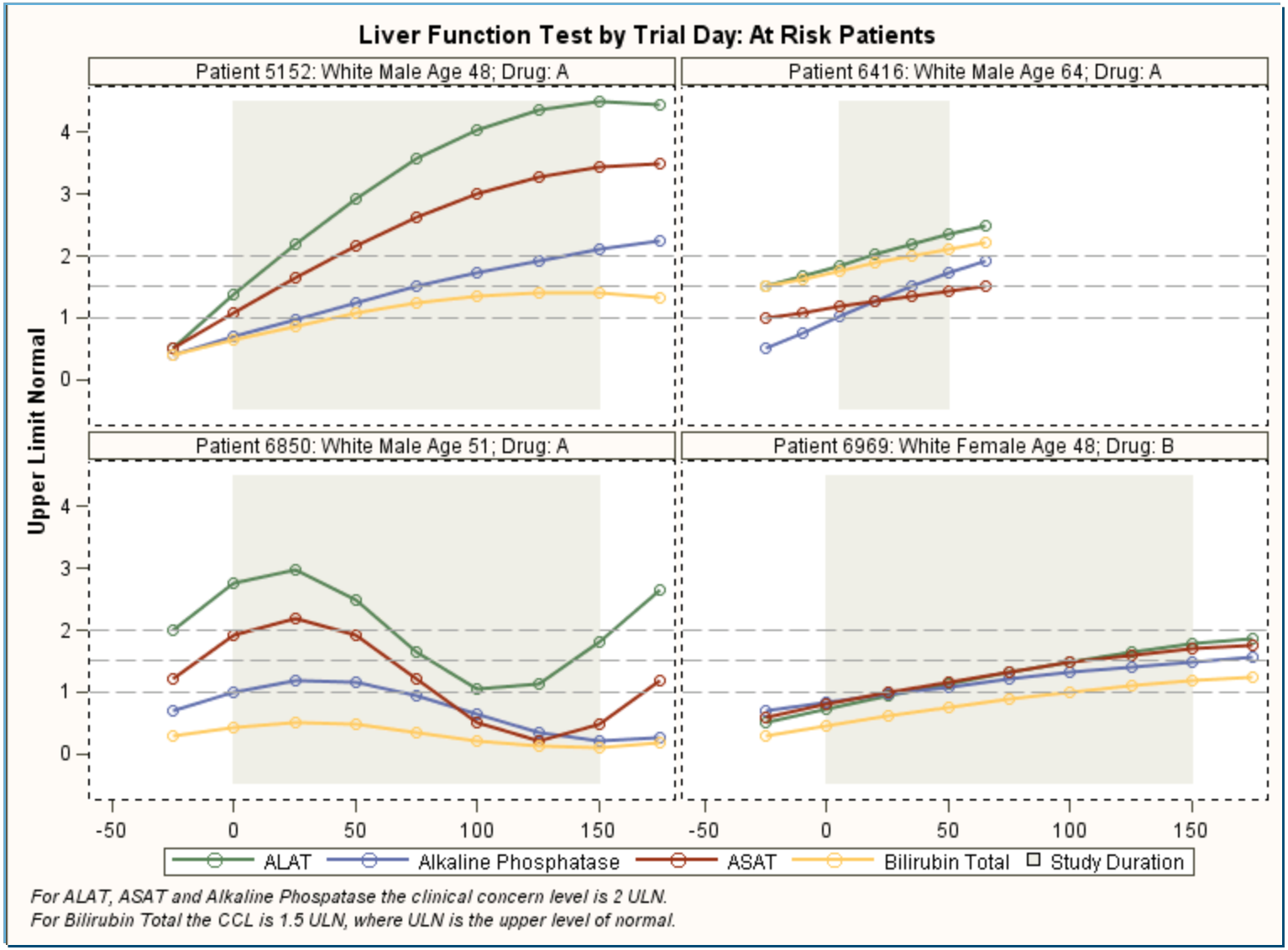
ODS Graphics Designer

- Allows the interactive design of ODS graphics via “drag-and-drop”
- Generates program code, which can be used to create permanent templates with then can be used with the SGRENDER procedure
- Graphics can also be saved as .SGD File und executed in “batch” with PROC SGDESIGN

ODS Graphics Designer



A „simple“ Example



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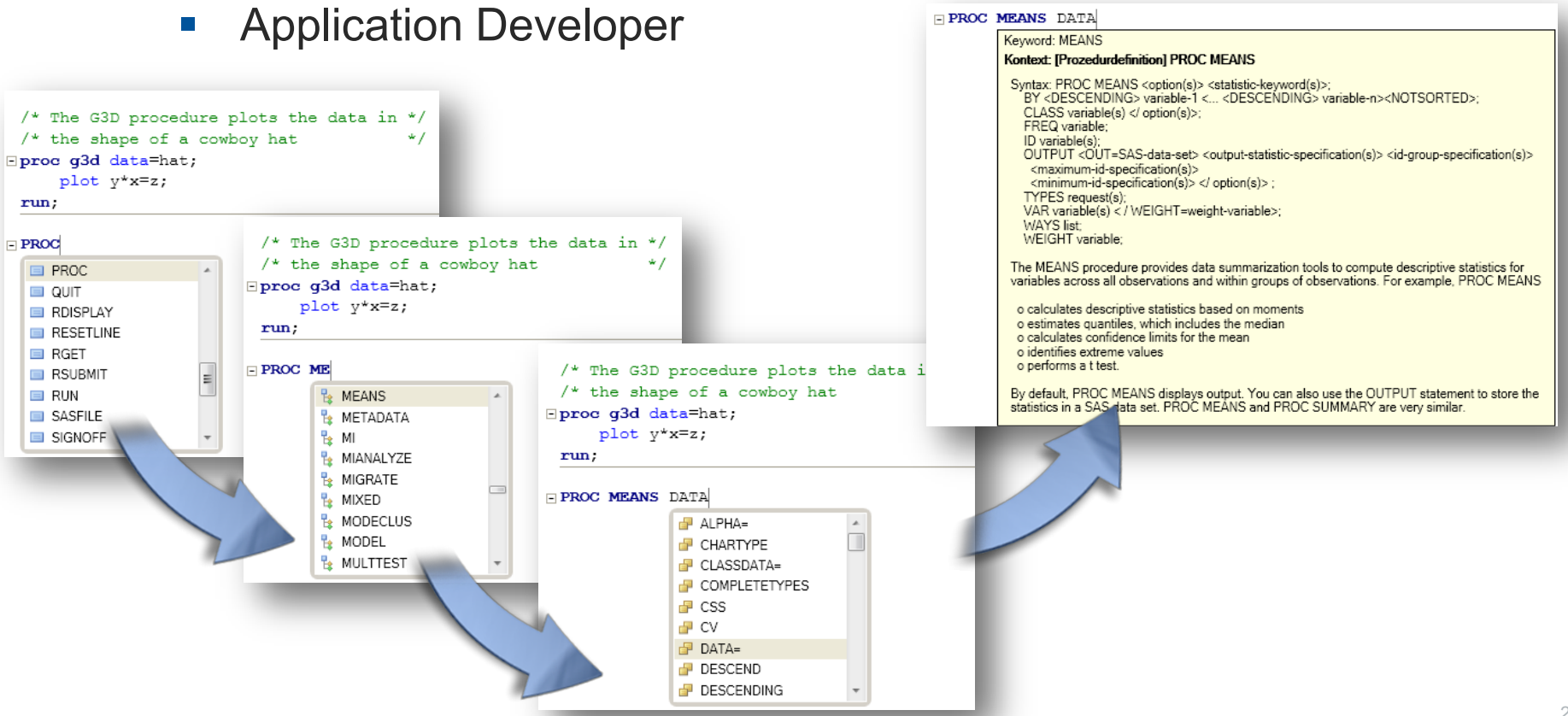
SAS Enterprise Guide 4.3

Programming with Tool-Tips and *„auto complete“*

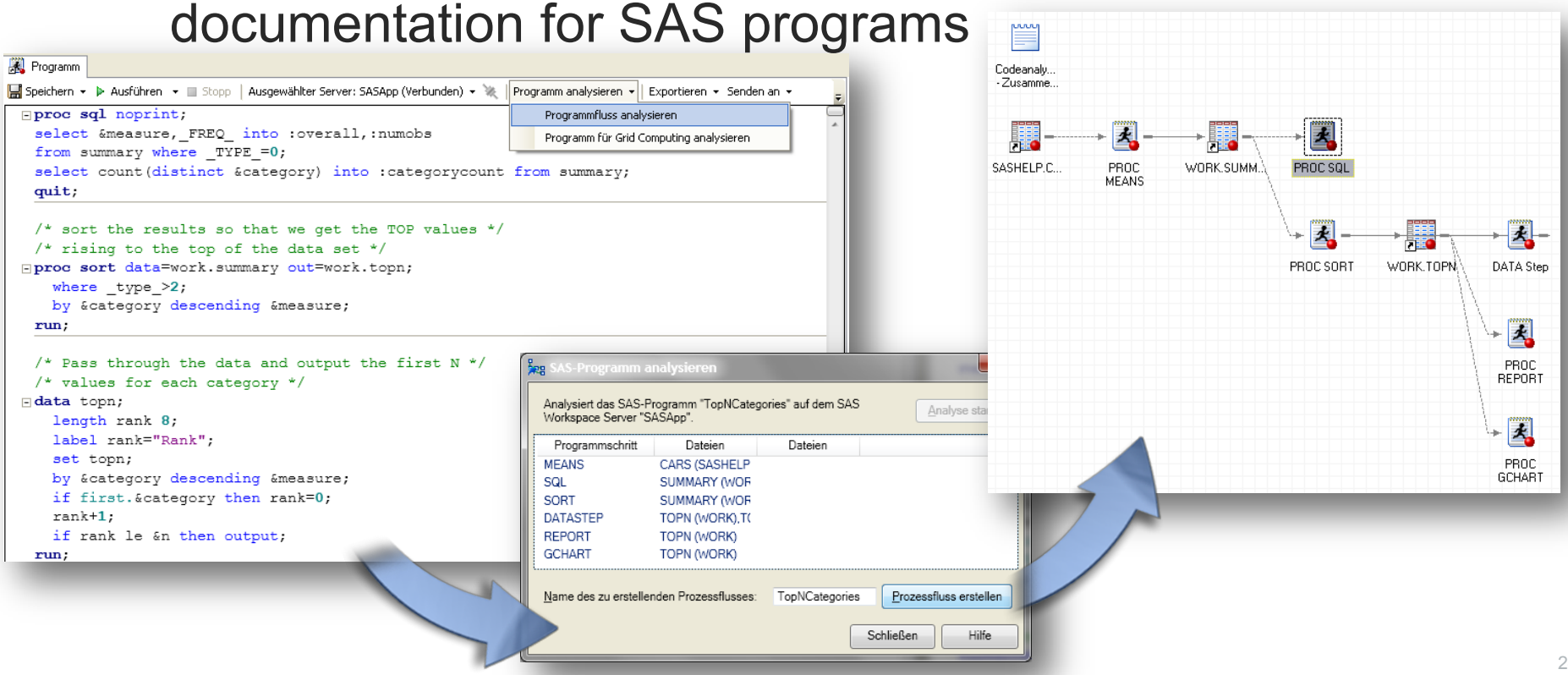
- Best support for
  - Programmer
  - Application Developer



SAS Enterprise Guide 4.3

Analyzing programs with *code analyzer*

- Visualizes SAS programs and transforms them to an Enterprise Guide process flow
- Enables you to have a quick overview and additional documentation for SAS programs



SAS 9.3 – Outlook

SAS Foundation (BASE, ODS, ….)

- ODS Graphics will be part of Base SAS
  - HTML is the new default Destination for Windows and UNIX
  - New default style for HTML (HTMLBlue)
  - Default for ODS Graphics will be on
  - ODS Graphics Designer & Editor will be shipped with Base SAS

- Cascading Style Sheets
- Entirely New Style Engine
- Context Base Style Selection
- Attribute Selectors
- Multiple Style Elements
- Media Types

Data Types

Name	Sex	Age	Height	Weight
Alfred	M	14	69	112.5
Alice	F	13	56.5	84
Barbara	F	13	65.3	98
Carol	F	14	62.8	102.5
Henry	M	14	63.5	102.5
James	M	12	57.3	83
Jane	F	12	59.8	84.5
Janet	F	15	62.5	112.5
Jeffrey	M	13	62.5	84

```
.table td[type=num] {
   background-color: silver;
}
.table td[type=char] {
   color: purple;
   font-weight: bold;
}

ods pdf cssstyle='mystyle.css';
```

SGF11 - *Unveiling the Power of Cascading Style Sheets (CSS) in ODS*
- *Introduction to ODS Graphics for the Non-Statistician*

Q & A