

Macro usage: %_mac_usage

PHUSE EU Connect 2025



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Intro

%_mac_usage

SAS macro to

- search macro invocations in multiple folders and subfolders
- classify macro locations
 - global location
 - study location
 - inner macro definitions
- generate detailed xlsx-reports.

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Why?

Why?

- (Automatically) populate program headers
- Help lead programmer in Project and/or Study oversight
- Regulatory Submission documentation and audit readiness
- Support Migration from dev to prod or into a new study
- Illustrate dependencies of macros
- Facilitate training and onboarding

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Design

Design

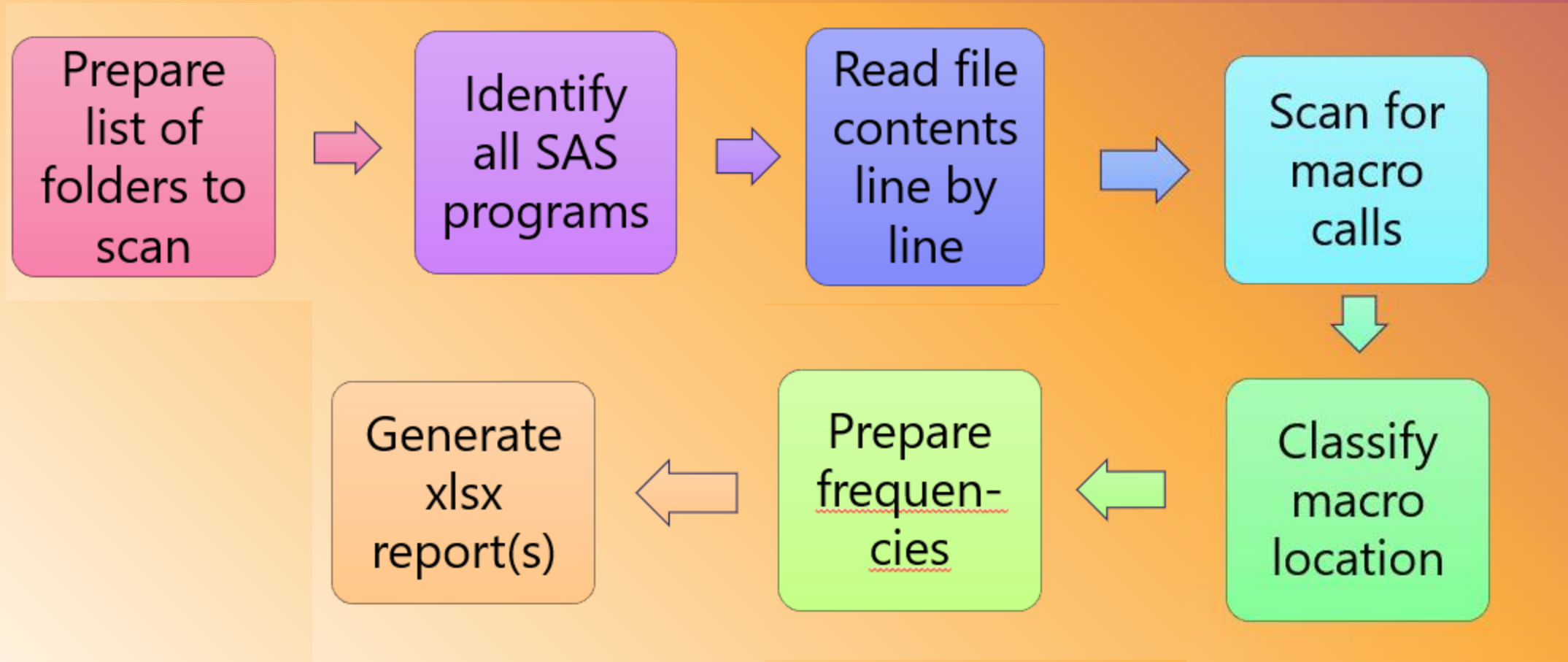
Scope of search

ROOT:	Search macro in one or multiple directories
SUBFOLDER:	Y/N search all subfolders
MACROS, PROGRAMS, CAT:	Restrict for macros, programs and category (Prod, Dev etc.)

Output and Reporting

OXLSXPATH:	Location of the report
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Flowchart (main steps)



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Key programming challenges

Step 1

Prepare
list of
folders to
scan

Split multiple root paths

Macro parameter **ROOT**: **ROOT**=path1|path2|path3,

```
%let _i=1;  
  %do %until (%qscan(%bquote(&ROOT.), &_i., %str(|)) = %str( )) ;  
    %let _root&_i.=%qscan(%bquote(&root.), &_i., %str(|)) ;  
    %put &_i.) Root path is &&_root&_i.;  
    %let _i=%eval(&_i.+1) ;  
%end;
```

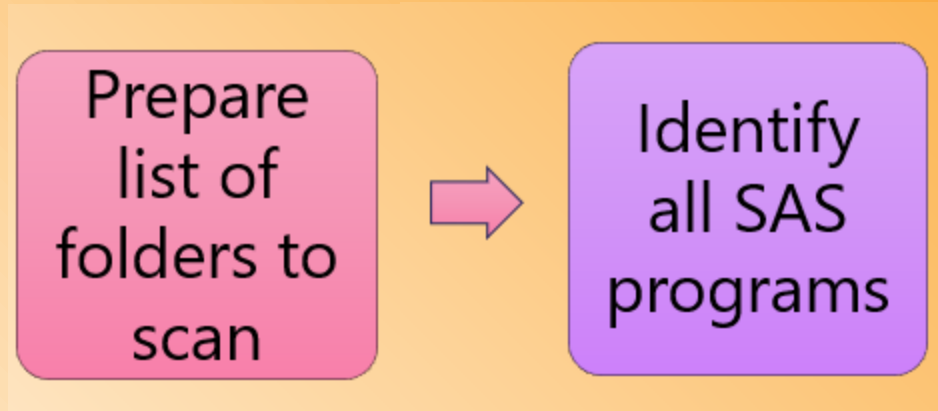
&&_root&_i.

&_root1=path1;
&_root2=path2;
&_root3=path3;

Common way to represent list
of values

The same technique can be applied for splitting macro locations based on SASAUTOS statement

Step 2



Collect *.sas programs to search for macro usage

&_i is the indicator the root folder

```
filename sasfiles&_i. pipe "dir /s /b &&_root&_i.\*.sas";
```

Runs external commands + captures output

```
data sasprograms&_i;  
  infile sasfiles&_i. trunccover;  
  input fullpath $300.;  
  fname=scan(fullpath, -1, "/\");  
  ...  
run;
```

sasprograms&_i.

fullpath	fname
path1	programname1
path2	programname2
...	
pathn	programnamen

Alternative: If the pipe engine is not available (e.g. due to regulation) you might use the data step and **dopen/dread** functions and scan through subfolders iteratively.

Step 3



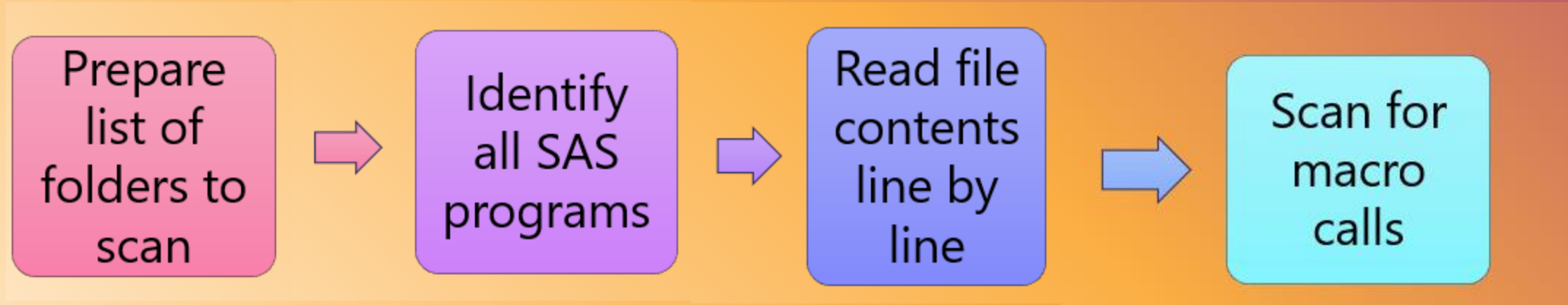
Combine all *.sas programs in one single dataset

```
data sasprograms_01;  
  length fullpath $300 progcode $500;  
  set sasprograms;  
  infile dummy filevar=fullpath end=eof truncover lrecl=500;  
  input progcode $char500.;  
  if not eof then output;  
run;
```

lets SAS open each file listed in
sasprogcode: each line of code is
read as a string

Assume that SAS dataset 'sasprograms' is combined from all sasprograms&i.

Step 4



Search dataset for all macro invocations *%macroname*

```
data macro_calls;
  set _sasprograms_01;
  length macro_call $50;
  pos = index(progcode, '%');
  line = progcode;
  do while (pos > 0 and pos < length(line));
    rest = substr(line, pos + 1);
    macro_call = scan(rest, 1, ' ( ) ; , = % . ' ' " ' ');
    if not (lowercase(macro_call) in
      ('if', 'then', 'do', ...)) and not missing(macro_call) then do;
      output;
    end;
    if index(substr(line, pos + 1), '%') > 0 then
      pos = pos + index(substr(line, pos + 1), '%');
    else
      pos = 0;
  end;
```

Extract substr starting just after %

The macro name ends at first non-word character (space, parenthesis, etc.)

Exclude SAS reserved/control words

Move to next possible macro in the same line

run;

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Reports

Reports1: Macro usage by program

1	Projec	Study	Request	Macro	Macro classification	Subfolde	Program name	Frequen	macloc
27	xxx	common	raw_adam	%_odsoutput	mlibrary	program	adam_codelist_issues	1	root/cdar/common/shared_programs/mlibrary/program
28	xxx	common	raw_adam	%_overlay_v0100	lib01	program	adam_codelist_issues	11	root/cdar/xxx/common/code_library/raw_adam/macro
29	xxx	common	raw_adam	%_read_excel	mlibrary	program	adam_codelist_issues	3	root/cdar/common/shared_programs/mlibrary/program
30	xxx	common	raw_adam	%adam_codelist_issues	Inner Definition	program	adam_codelist_issues	1	
31	xxx	common	raw_adam	%c_list	mlibrary	program	adam_codelist_issues	6	root/cdar/common/shared_programs/mlibrary/program
32	xxx	common	raw_adam	%c_varlist	mlibrary	program	adam_codelist_issues	13	root/cdar/common/shared_programs/mlibrary/program
36	xxx	common	raw_adam	%_dropmiss	mlibrary	program	azsol_anno	1	root/cdar/common/shared_programs/mlibrary/program
37	xxx	common	raw_adam	%_odsoutput	mlibrary	program	azsol_anno	1	root/cdar/common/shared_programs/mlibrary/program
38	xxx	common	raw_adam	%_read_excel	mlibrary	program	azsol_anno	7	root/cdar/common/shared_programs/mlibrary/program
39	xxx	common	raw_adam	%a	3 different macro locations		azsol_anno	1	
66	xxx	common	raw_adam	%_			impl_progress	10	root/cdar/common/shared_programs/mlibrary/program
67	xxx	common	raw_adam	%_impl_progress	Inner Definition	program	impl_progress	1	
68	xxx	common	raw_adam	%_odsoutput	mlibrary	program	impl_progress	1	root/cdar/common/shared_programs/mlibrary/program
69	xxx	common	raw_adam	%_read_excel	mlibrary	program	impl_progress	1	root/cdar/common/shared_programs/mlibrary/program
125	xxx	common	xcr	%_convert	mlibrary	program	cr02	3	root/cdar/common/shared_programs/mlibrary/program
126	xxx	common	xcr	%_f_comparelist	mlibrary	program	cr02	2	root/cdar/common/shared_programs/mlibrary/program
127	xxx	common	xcr	%_f_maxlength	mlibrary	program	cr02	1	root/cdar/common/shared_programs/mlibrary/program
128	xxx	common	xcr	%_frq	mlibrary	program	cr02	1	root/cdar/common/shared_programs/mlibrary/program
129	xxx	common	xcr	%_odsoutput	mlibrary	program	cr02	1	root/cdar/common/shared_programs/mlibrary/program
130	xxx	common	xcr	%_read_excel_v0103	lib01	program	cr02	1	root/cdar/xxx/common/code_library/raw_adam/macro
131	xxx	common	xcr	%c_varlist	mlibrary	program	cr02	1	root/cdar/common/shared_programs/mlibrary/program
132	xxx	common	xcr	%cr_overview	Inner Definition	program	cr02	1	

Multiple root folders

Filtered for selected programs

Reports2: Matrix design

projec	study	request	mactype	type	cat	pgmfold	f_comparelist	c_list	convert	f_maxlength	c_varlist	f_format	assign_width	odsoutput	read_excel	dropmiss	freq	emailgw	mac_usage	chk_projects	funct	email	TOTAL
xxx	common	raw_adam	mlibrary	program	adam_codelist_issues.sas	program	.	1	.	.	1	.	.	1	1	.	.	.	.	.	.	.	4
xxx	common	raw_adam	mlibrary	program	azsol_anno.sas	program	.	.	.	.	.	.	1	1	1	.	.	.	.	.	.	.	3
xxx	common	raw_adam	mlibrary	program	impl_progress.sas	program	.	.	.	.	.	.	1	1	.	1	.	.	.	.	.	.	3
xxx	common	xcr	mlibrary	program	cr02.sas	program	1	.	1	1	1	.	.	1	.	.	1	.	.	.	.	.	6

Reports3: Macro usage by root folder

projec	study	request																		
				assign_width	convert	drop miss	email gw	f_comparelist	f_format	f_maxlength	freq	mac_usage	odsoutput	read_excel	c_list	c_varlist	chk_projects	funct	email	TOTAL
xxx	common	raw_adam	1	3	1	5	3	2	3	2	1	9	10	7	5	.	.	.	52	
xxx	common	synthetic	2	.	.	.	.	.	.	3	.	3	.	2	2	14	1	.	27	
xxx	common	xcr	.	3	.	.	2	1	2	1	.	3	.	3	3	.	.	1	19	
			3	6	1	5	5	3	5	6	1	15	10	12	10	14	1	1	98	

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Summary & Outlook

Summary and Outlook

- Most usage scenarios require minimal parameters
- Automates routine traceability tasks
- Facilitates robust code reviews
- In future would build macro with help of AI



Thank You

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