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CALLING R FUNCTIONS FROM SAS
INTERWORKING BETWEEN DIFFERENT SERVERS

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Crossing the Technical Frontier

Possibilities that exist in the programming language R:

- ✓ R provides efficient statistical features and comprehensive graphical output
- ✓ There are packages available to use in R that can help shorten the time to market
- ✓ Regulatory agencies are starting to accept submissions using R in addition to SAS

Scope of this talk:

Build synergies: Integration of R functionality into SAS;
Technical realization of 'Calling R Functions from SAS'.

Calling R Functions from SAS

PhUSE 2011, Paper CS 07

Calling R Functions from SAS

Dr. Peter Bewerunge

The article describes how R functions can be called directly through a built-in SAS procedure called PROC IML.

Functionality:

- ✓ Submit R Code from SAS
- ✓ Send SAS datasets to R
- ✓ Send R datasets to SAS
- ✓ Error handling (basic form)

Bewerunge, P. Calling R Functions from SAS PhUSE, 2011, 1-7

SAS interface to R realized trough PROC IML

Limitations:

- The R software comes along with absolutely no warranty (critical especially for the large amount of add-on-packages)
- The use of large data sets is limited. In R / SAS IML the data are loaded and processed in the main memory.
- Every data type has to be converted either to a *data.frame* or a *matrix* before transferring data to SAS.

Bewerunge, P. Calling R Functions from SAS PhUSE, 2011, 1-7

SAS interface to R realized trough PROC IML

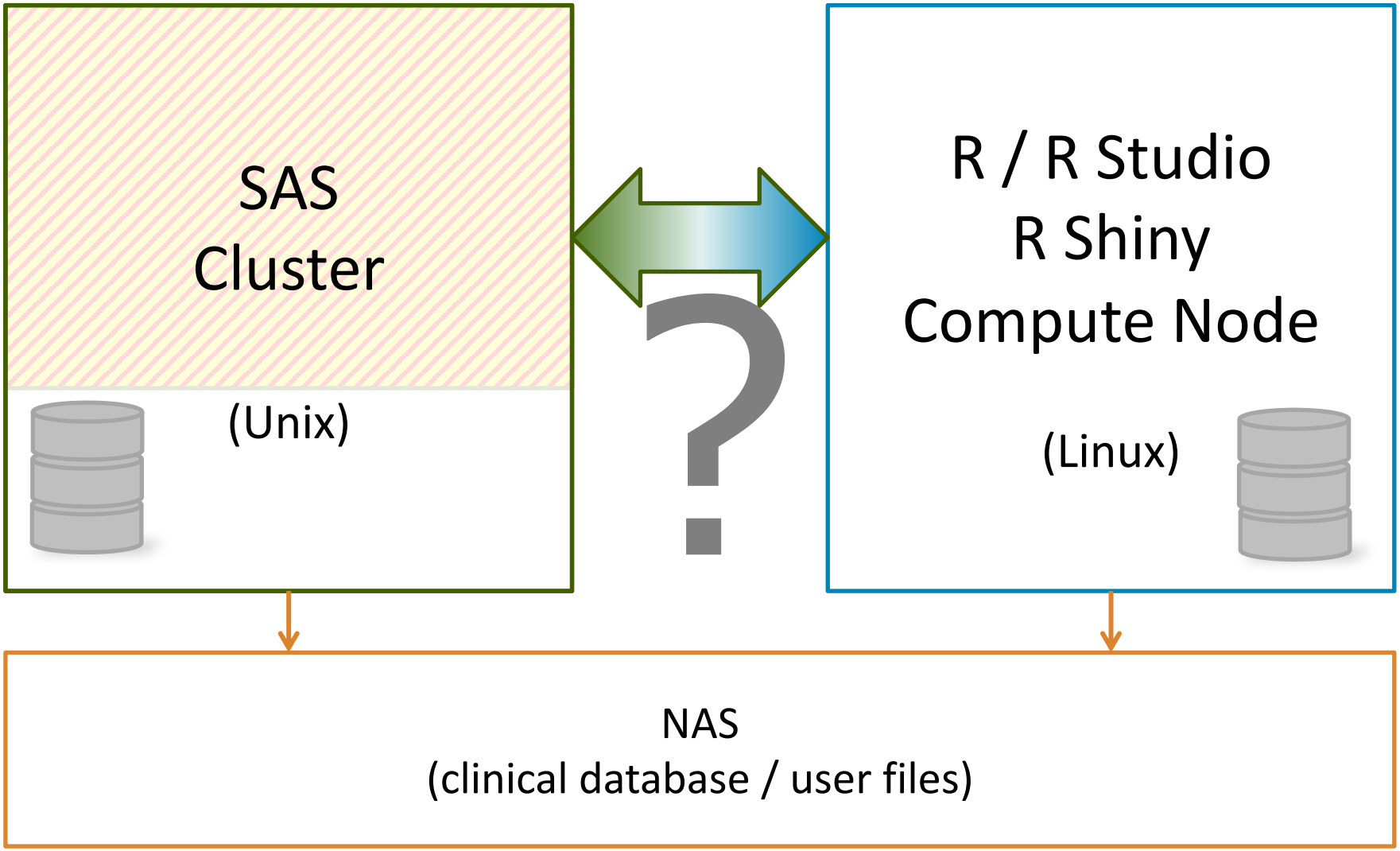
Key Requirement:

— SAS and R must be installed on the same computer

- From an infrastructure integrity and maintenance perspective, it is desirable to keep SAS and R separate on different servers.
- Especially true, if either or both run in a validated environment.
- SAS and R on different servers allow easier scalability; independently for SAS and R

Summary: A direct calling of R functions through the IML procedure in SAS may not be the preferable option.

Infrastructure Scenario



Solution

%RUNANYR (SAS macro)

Functionality:

- ✓ Submit R Code from SAS
- ✓ Send R datasets to SAS
- ✓ Error handling

Minimal Example – Code

MIN.sas
SAS System Program
340 Bytes

MIN.sas *

```
*START;
%RUNANYR(home, MIN.R);

PROC PRINT
     DATA=home.mydata;
RUN;

QUIT;
```

MIN.R
R-Datei
156 Bytes

= User Input

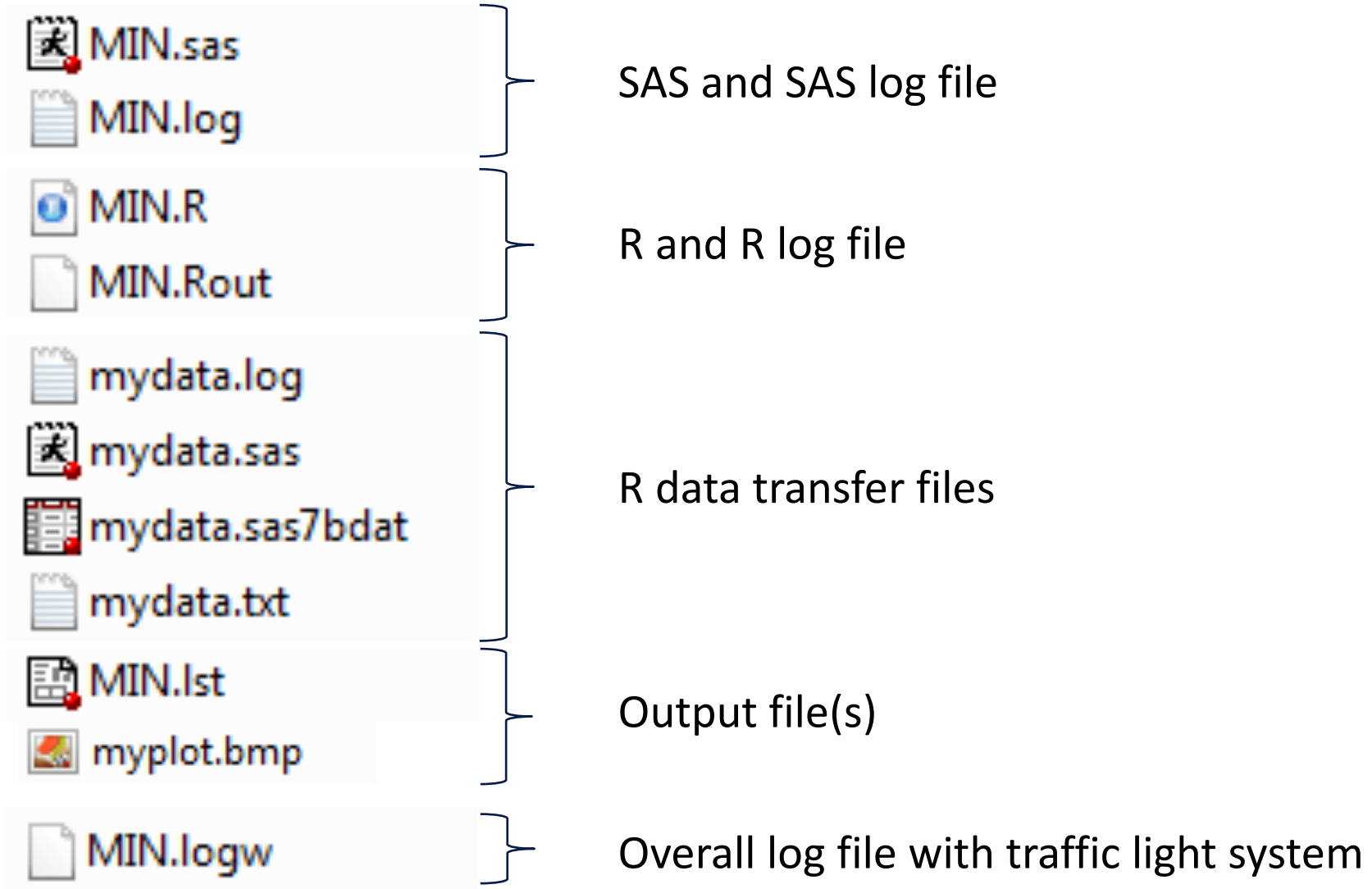
MIN.R*

Source

```
1  #START
2  library(foreign)
3
4  x <- data.frame(1:10)
5
6  write.foreign(x,
7    "/home/mydata.txt",
8    "/home/mydata.sas",
9    package="SAS")
10
11 bmp(filename=
12   "/home/myplot.bmp")
13   plot(x[[1]])
```

1:1 (Top Level) R Script

Minimal Example – Files

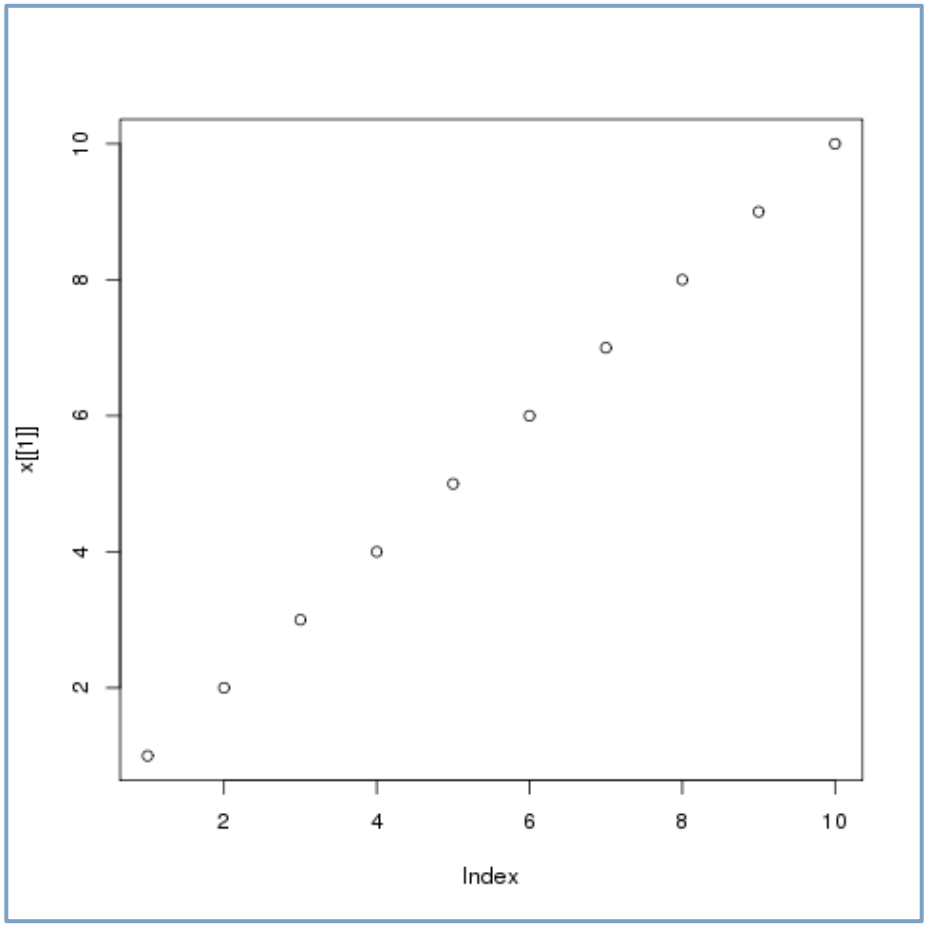


Minimal Example – Output

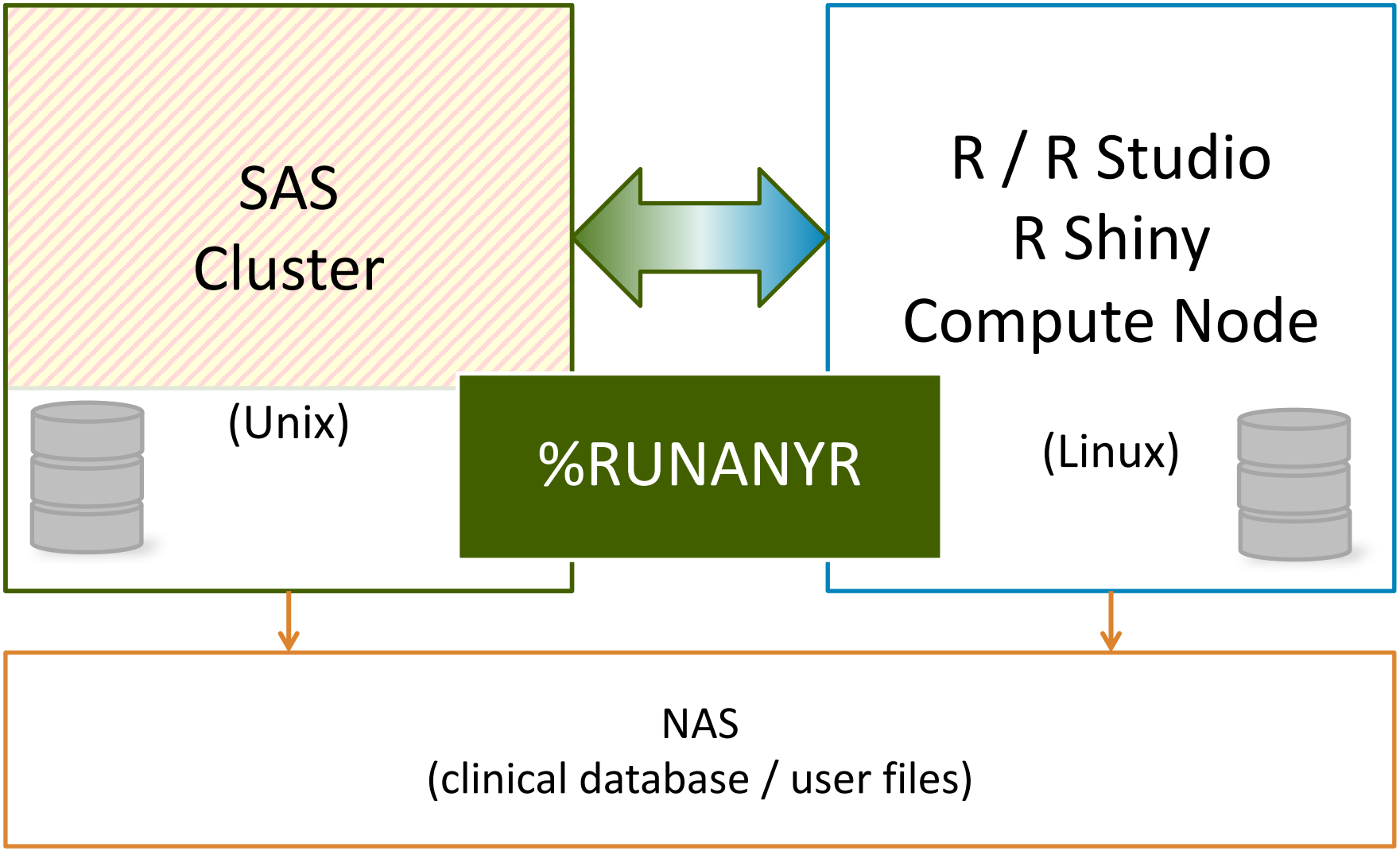
= SAS process
= R process

The SAS System

Obs	X1_10
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10



Infrastructure Scenario



Deep dive into %RUNANYR

%RUNANYR (SAS macro)

```
%MACRO RUNANYR(folder,program,sasversion=9.4);
DATA _NULL_;
CALL SYSTEM("sas930 /app/cs/sw/bin/run_any_r.sas -sysparm %str(%"&folder, &program, &sasversion%")");
RUN;
%MEND RUNANYR;
```

Deep dive into %RUNANYR

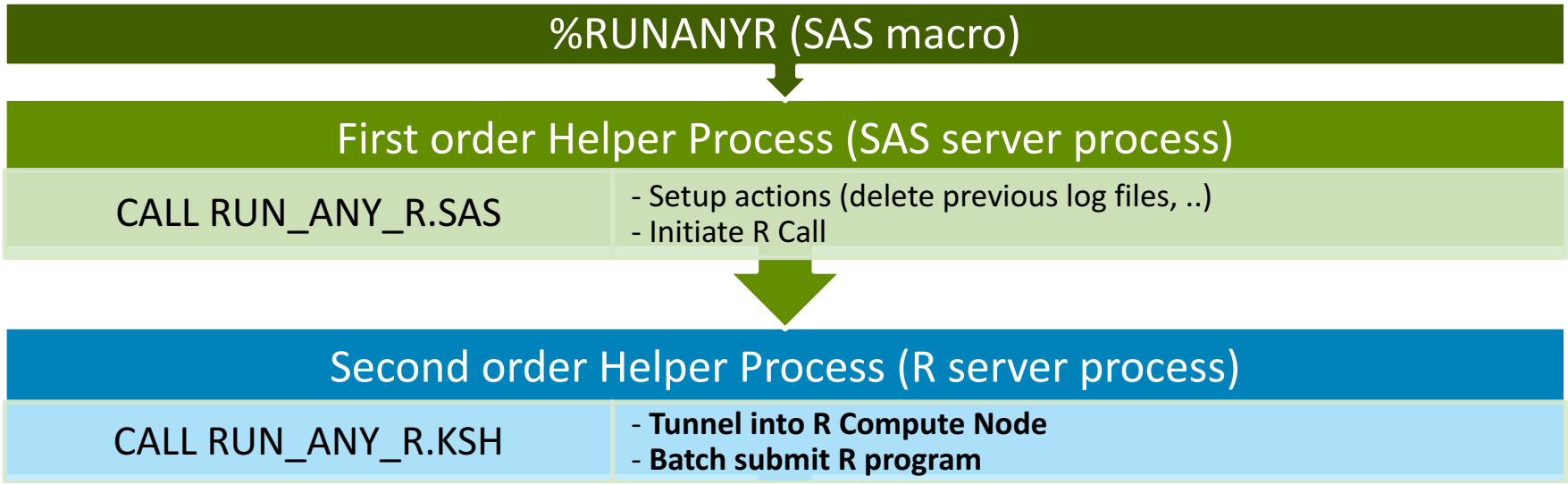
%RUNANYR (SAS macro)

First order Helper Process (SAS server process)

CALL RUN_ANY_R.SAS	- Setup actions (delete previous log files, ..) - **Initiate R Call**

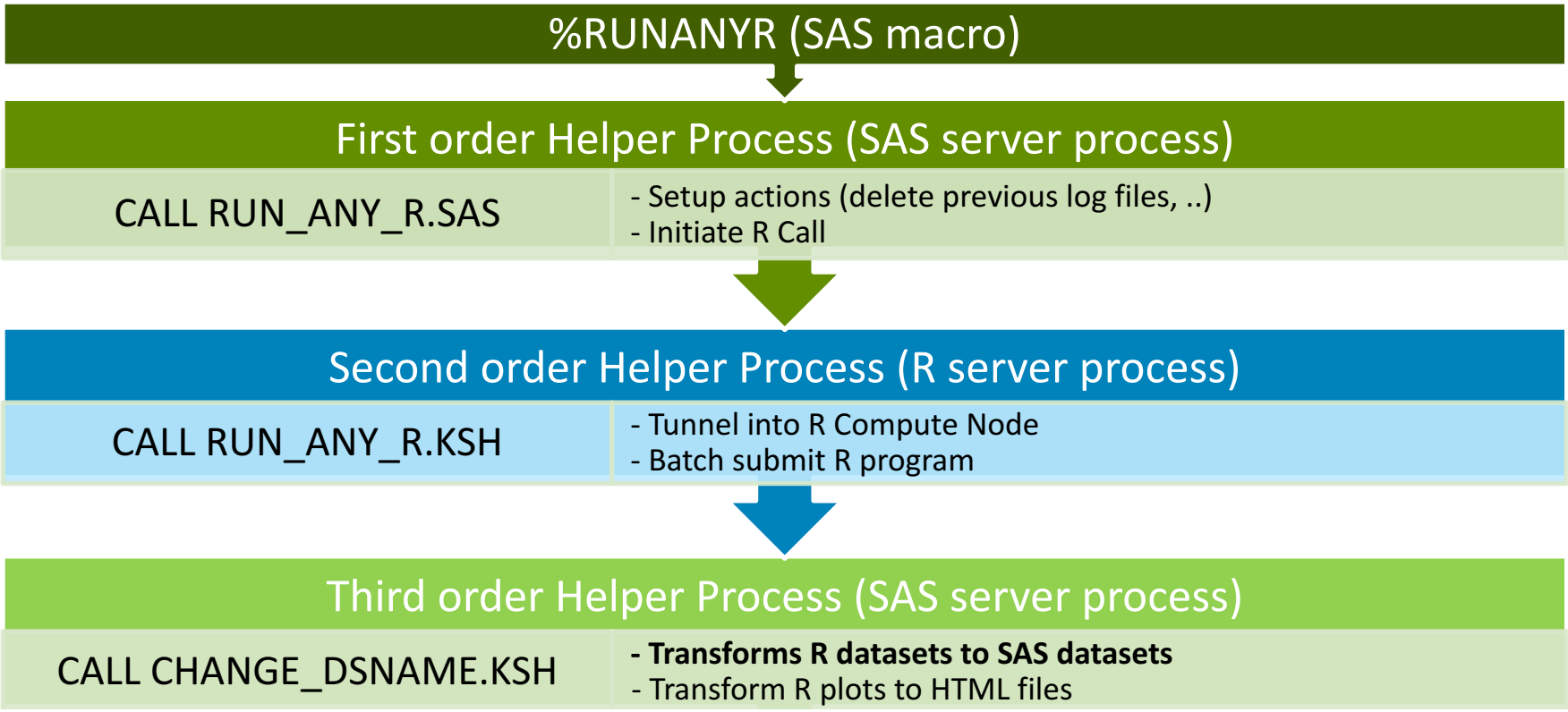
```
DATA _NULL_;
 call system(". run_any_r.ksh &r_dir &r_prog");
 RUN;
```

Deep dive into %RUNANYR



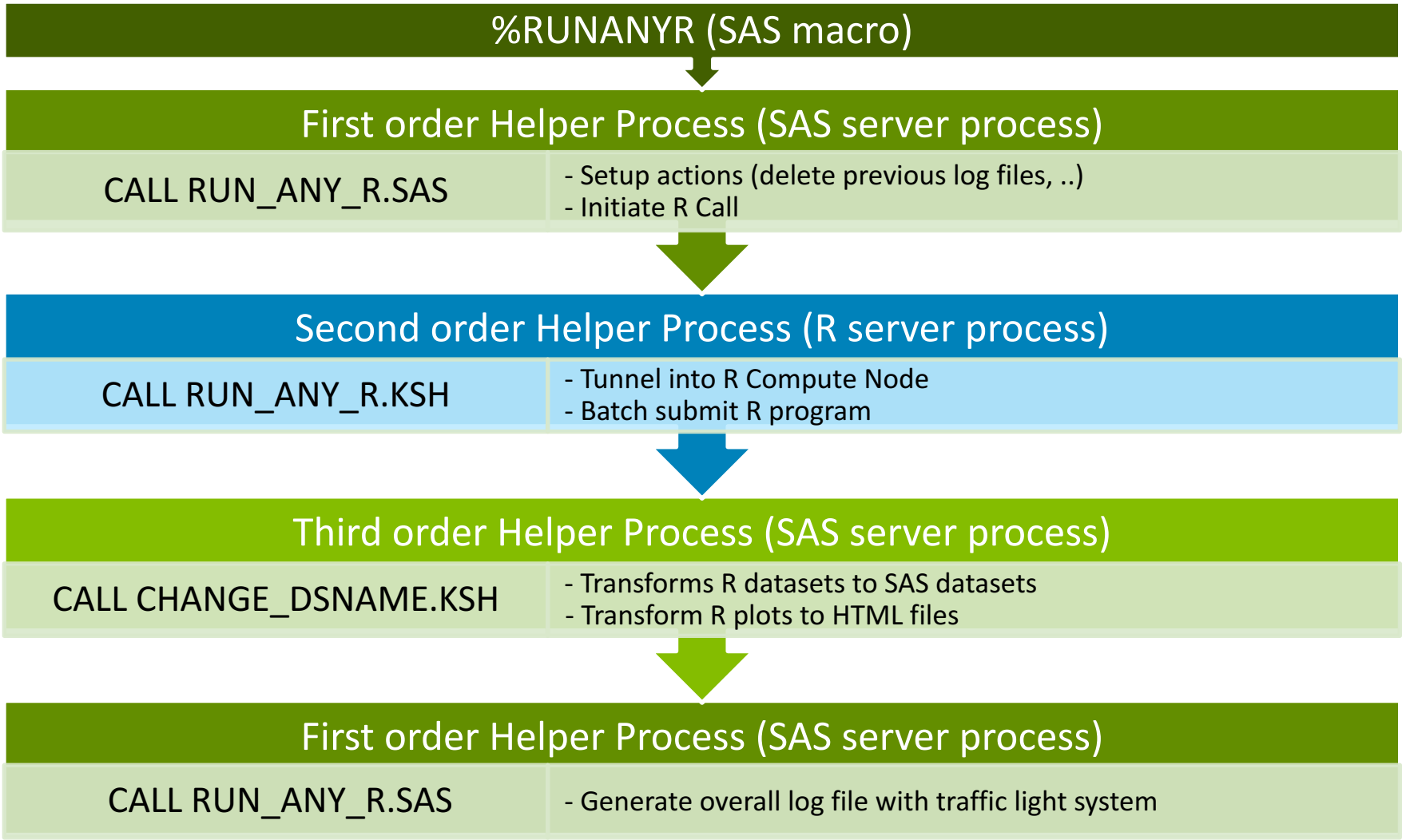

```
ssh rserver.abbvienet.com 2>/dev/null << EOT
cd $1
R CMD BATCH $2
EOT
```

Deep dive into %RUNANYR

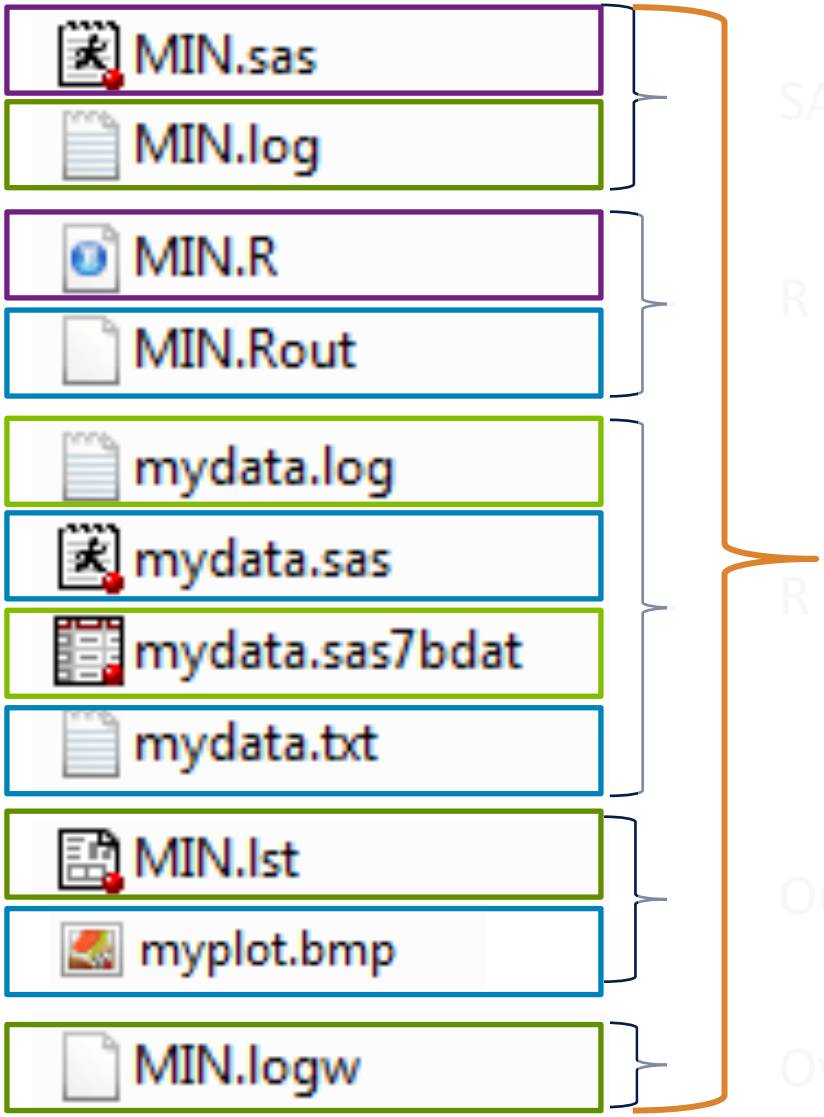



```
for file1 in $sas_progs
 do
    $sasperl $dir_name/${sas_name}.sas
 done
```

Deep dive into %RUNANYR



Revisiting the Minimal Example – Why does it all work?



= User Input
= SAS process
= R process
= NAS

Seamless communication between SAS and R ensured as all physical files are located on a common NAS drive.

Summary

Access R through PROC IML

Functionality:

- Submit R Code from SAS
- Send SAS datasets to R
- Send R datasets to SAS
- Error handling (basic form)

Limitations:

- As above

Access R with CALL functions

Functionality:

- Submit R Code from SAS
- Send SAS datasets to R
- Send R datasets to SAS
- Error handling

Limitations:

- As above

Summary

Access R through PROC IML

Key Requirement:

SAS and R must be installed on the same computer/server

Additional factors:

Easy setup and installation

Single file containing both SAS and R code

Access R with CALL functions

Key Requirement:

SAS and R can be located on different servers

Additional factors:

Flexibility in choice of R version

File containing SAS code and multiple files containing R code

Files can be edited with the naïve editors (SAS/RStudio)

Thank you for your attention!

Stefan Englert

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