Industrializing an energy market data modelling system

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SAS Curiosity Forum - 13/06/2019

Agenda

- **Example of a business critical system fully developped in SAS, managed and operated by a small team**

- **Example of a migration from a stand-alone system running SAS 9.3 to a SAS Server running SAS 9.4**
  - **Data collection:** Excel VBA replaced with Web queries and SOAP requests in SAS
  - New **system console** using Stored Processes called as Web Applications
  - **Graphs:** Excel replaced with Graph Template Language (GTL)

Luminus

- **Luminus is a major player on the Belgian energy market**
- **Around 20 % of gas and electricity market share**
- **Activities**
  - Produce and resell electricity
  - Resell gas
  - Deliver energy services

Market data and shaping

- **What is the purpose of our system?**
  - Collect energy market data and apply quality checks
  - Shape future prices as hourly or monthly prices (in-house methodologies)
  - Publish data quality reports and export data to other systems

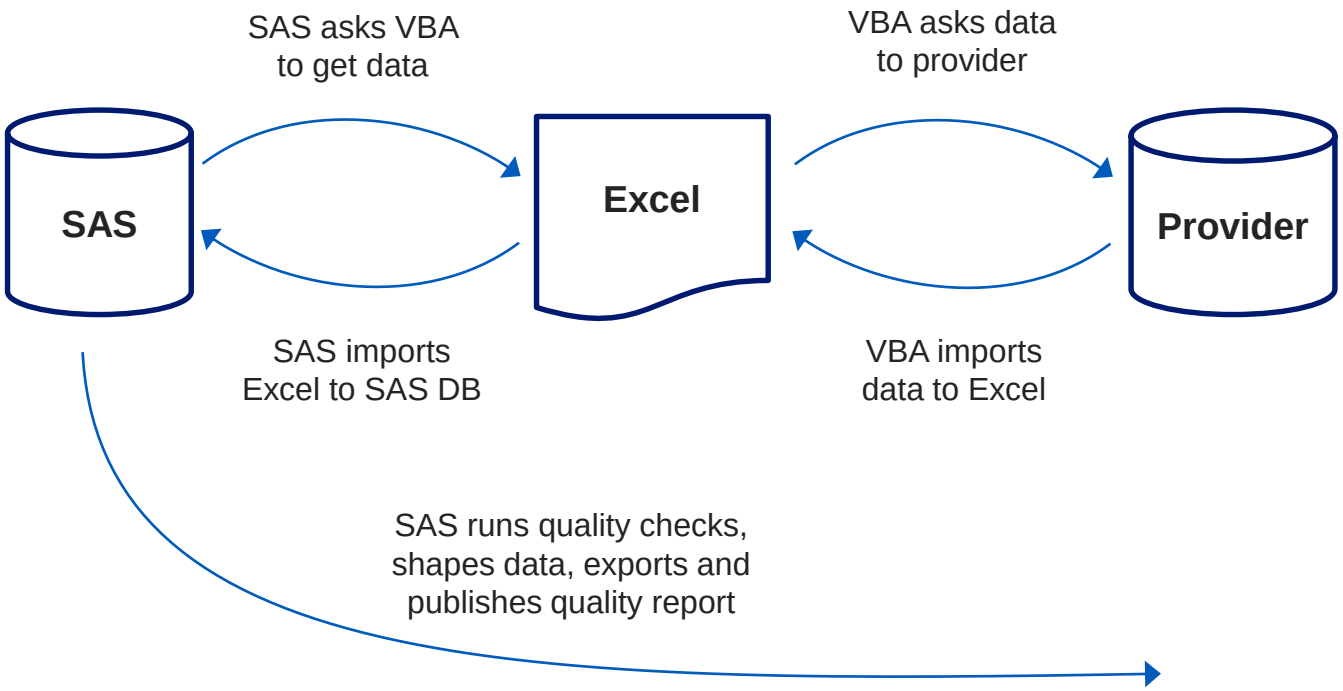
- **Why is it business critical?**
  - Pricing
  - Invoicing
  - Portfolio optimization

- **How is it maintained and operated?**
  - System scheduled to run 6 times/day, from 4:30 AM to 10 PM
  - « Family business »
    - 2 persons for analysis, methodology design and SAS implementation
    - Morning and evening runs monitored by Short Term Traders (at the office 24/7): interface should be user-friendly enough for them

Market data sources

- **Mainly 2 external data providers**
  - Stable format
  - But several missing or wrong prices several times per month
- **Some internal sources: Excel files produced by in-house tools**
- **Specific quality checks required for prices delivered by our traders**

Legacy system – Data flow for scheduled runs



Legacy system – Processing data issues

Mario asks VBA to get data

or

Mario manually enters data

Excel

same Excel file!

Excel

VBA asks data to provider

VBA imports data to Excel

Provider

… then Mario launches a new run where SAS will **not** update the Excel file

Legacy system – Connection to external providers

Data provider « EDB »

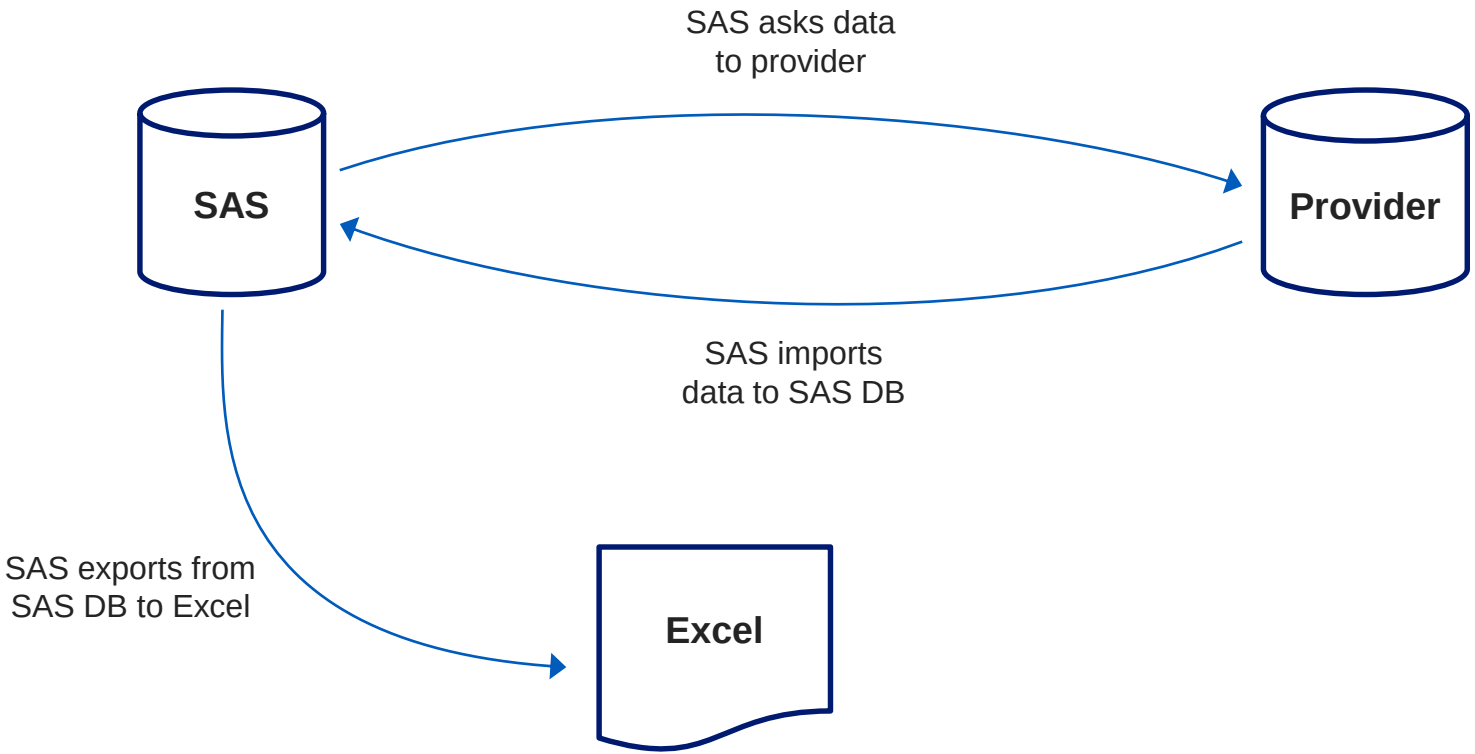
- Web queries with data series ID included in URL
- Web queries stored in Excel
- « Refresh data » to get new data
- Authentication by SSL certificate

Data provider « MME »

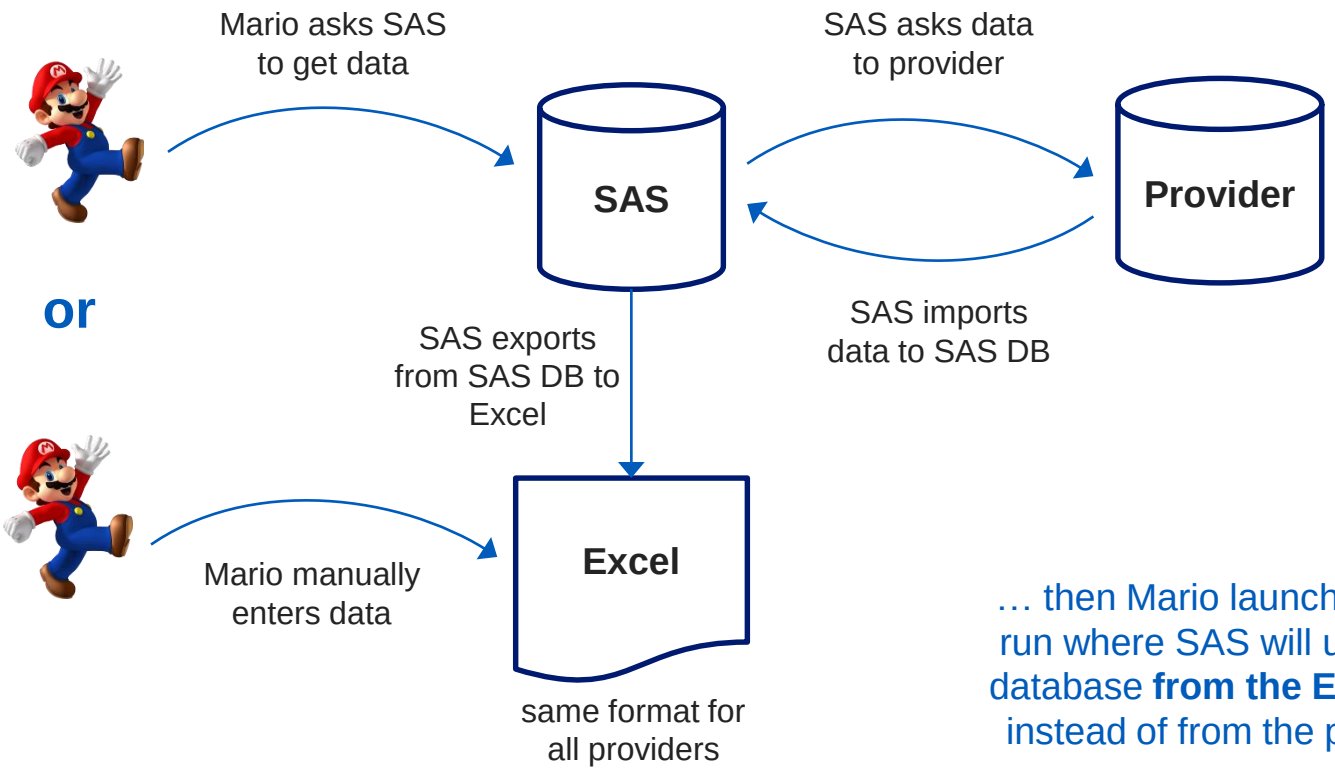
- Specific add-in developed by MME
- Data series ID stored in Excel
- Call the add-in to get new data
- Authentication by userid/ password stored in the add-in

Import in SAS is more than a PROC IMPORT: parsing is needed

New system – Data flow for scheduled runs



New system – Manual processing of data issues



… then Mario launches a new run where SAS will update its database **from the Excel files** instead of from the providers

New system – Web queries

- **Web query is the only protocol available from EDB**
- **SAS calls curl.exe to retrieve data in a HTML file**
  - Authentication certificates passed as parameters to curl
  - Note: curl requires certificates in .pem files.

    OpenSSL used to convert .cer and .pfx to .pem
- **Specific parsing algorithms had to be developed from scratch**

  In this case, they were rather simple!

New system – SOAP requests

- **Web services (SOAP) available from provider MME**
- **Retriving data:**
  - Simple SAS code to build a XML SOAP enveloppe (format documented by MME)
  - Userid/password in the enveloppe
  - Call PROC SOAP to send the enveloppe and retrieve an XML file
- **Libname xmlv2 to parse the XML file using an XML map built with SAS XML Mapper**

SAS Stored Processes

- **A Stored Process is a SAS program which is stored on a server and which can be executed as requested by client applications.**
- **SAS Stored Process Web Application executes a stored process and returns results to a web browser**

```
http://xxxxx/SASStoredProcess/do?_program=mdm_sp_update&dataSeries=MD_FWD_GASTFF&source=EDB
```

name of the Stored Process

macro variable `dataSeries` initialized to value `MD_FWD_GASTTF`

Use Stored Processes for the system console

Part of the HTML quality report generated by SAS

2. Market data source file(s)

Source file	Sheets
MD_SET_HERENTTFDAH.xlsx	quotes

Click here to refresh from MME

Alternative sources: see MarketDataSources.xlsx

Click here to see the MME chains

Summary
MD_SET_HERENTTFDAH has been refreshed from MME. There is no new quotedDate. The latest quotedDate is 22MAR2019. There are no new values.
Click here to save MD_SET_HERENTTFDAH to Excel
Alternative sources: see MarketDataSources.xlsx Back to Run Dashboard

Latest quotes available for MD_SET_HERENTTFDAH

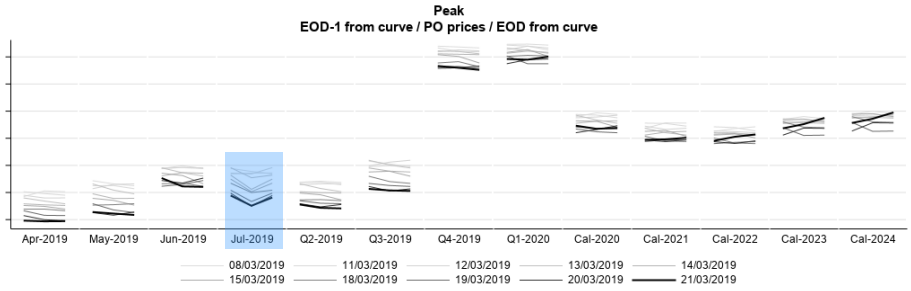
Product	22/03 MID	new	21/03 MID
DAY-AHEAD	14.2125		14.5375
WEEKEND	14.2125		14.5375

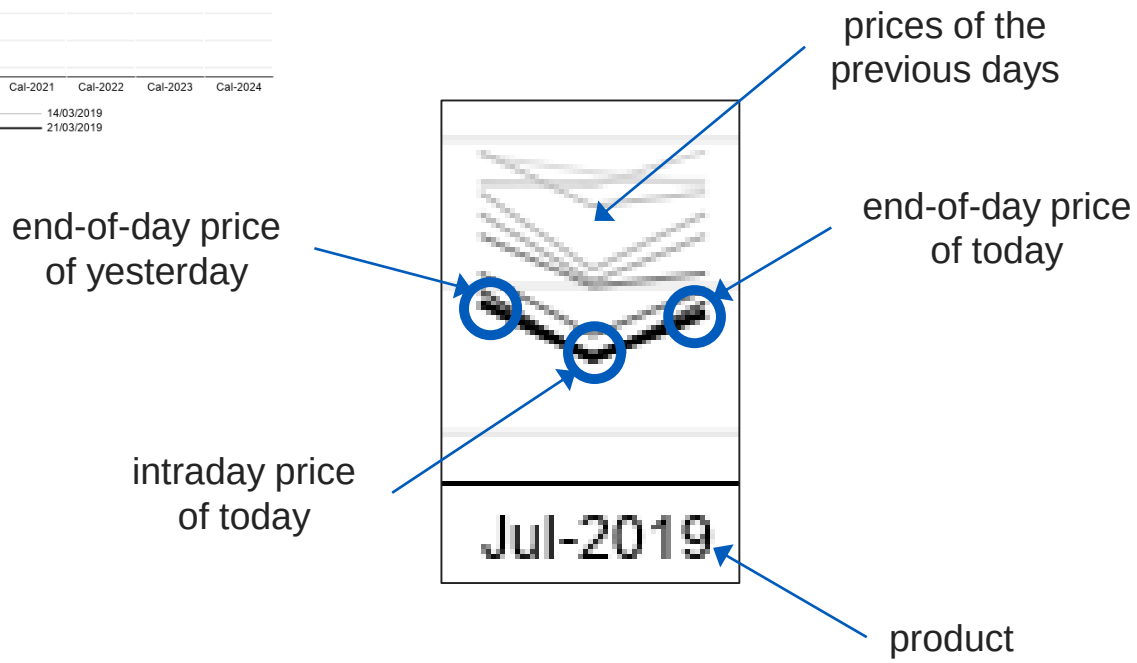
Period	Observation	ESID
DAYAHEAD	MID	ENG.TTF.DAY_AHEAD.PROMPT.PH.M
WEEKEND	MID	ENG.TTF.WEEKEND.PROMPT.PH.M

GTL graphs

- **As part of our quality check process, emails are sent to our traders with graphs showing price evolutions**
- **Legacy system:** SAS exports data to an Excel file and then calls a VB script to ask Excel to format the graphs and send them by email
- **New system:** (complex) graphs implemented in SAS using the Graph Template Language (GTL) and sent by SAS in SMTP emails

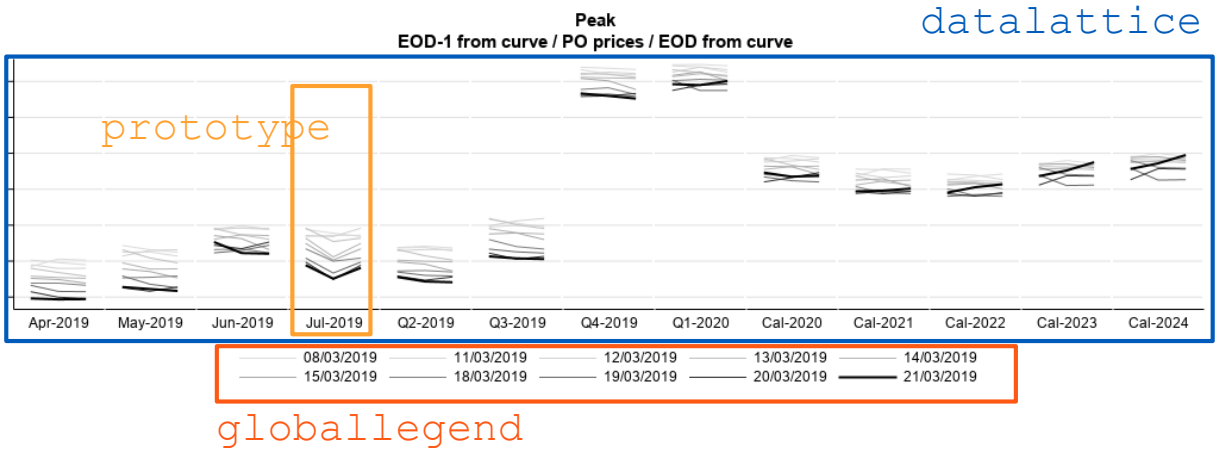
Example of GTL graph





Example of GTL graph

```
proc template;
  define statgraph …
    begingraph …
      layout datalattice columnvar=product
        layout prototype
          seriesplot … / group=date
        endlayout;
      endlayout
      layout globallegend
        …
      endlayout;
    endgraph;
   end;
run;
```



Apply template to a dataset:

```
proc sgrender
```