WW Pmod SMLD Quality Control System

This project builds, maintains a database, and monitors SSVE Pmod performance by week.

It minimizes significant labor hours, eliminates human errors and speeds up the whole process.

This project makes monitoring WW Pmod SMLD Quality in real time possible.

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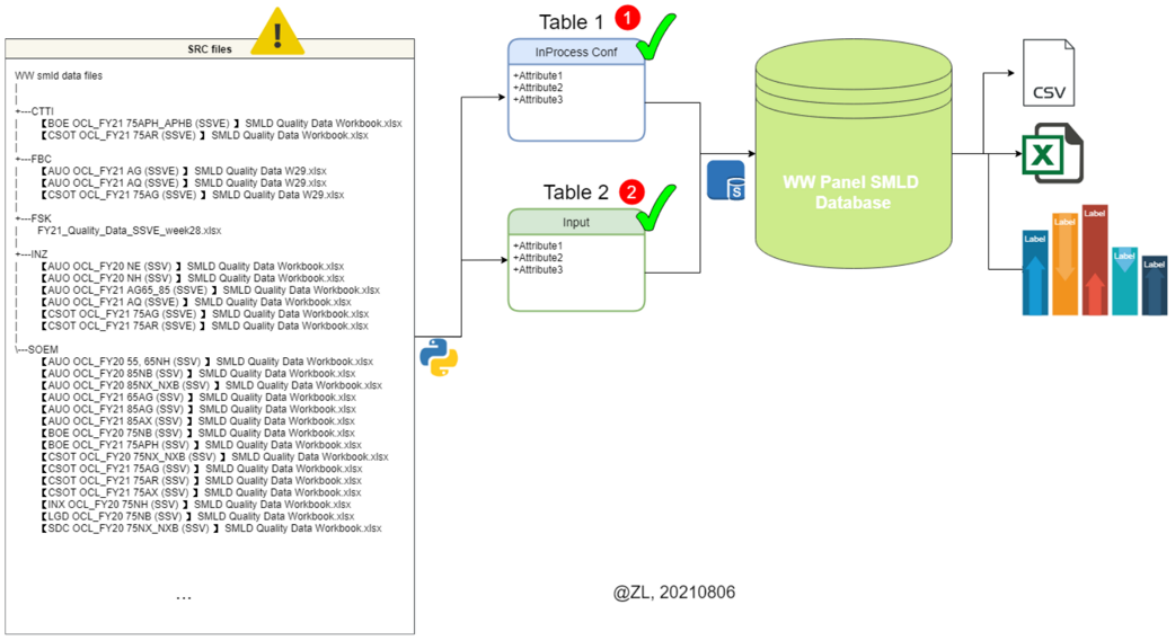
Changelog

- v0.01, initial build
- v0.02, clean and format algorithms
- v0.03, change design pattern: split into two dataframes: defects, inputs
- v0.04, add more columns to prepare for visualization
- v0.05, fix TVPlant column, "SO'EM" -> "SOEM"
- v0.06, add an option to run `main.py` by using `main.bat` (Batch script)
- v0.07, refactor the core using `Builder` design pattern
- v0.08, restructure the dependency structure (divide-and-conquer)

Schema



Project structure

```
C:.
|   .gitignore
|   20210806 WW_Panel_SMLD_Database v0.02.pptx
```

```
    |  main.bat
    |  main.py
    |  requirements.txt
    |
    ├─data
    |  ├─CTTI
    |  |      【BOE OCL_FY21 75APH_APHB (SSVE) 】SMLD Quality Data Workbook.xlsx
    |  |       ...
    |  |
    |  ├─FBC
    |  |      【AUO OCL_FY21 AG (SSVE) 】SMLD Quality_W49.xlsx
    |  |       ...
    |  |
    |  ├─FSK
    |  |      FY21_Quality_Data_SSVE_week50.xlsx
    |  |
    |  ├─INZ
    |  |      【AUO OCL_FY20 NH (SSV) 】SMLD Quality Data Workbook.xlsx
    |  |       ...
    |  |
    |  └─SOEM
    |          【AUO OCL_FY20 55, 65NH (SSV) 】SMLD Quality Data Workbook.xlsx
    |          【AUO OCL_FY20 85NB (SSV) 】SMLD Quality Data Workbook.xlsx
    |           ...
    |
    ├─docs
    |      design.png
    |      DevelopManual.html
    |      DevelopManual.md
    |      DevelopManual.pdf
    |      info.text
    |      performance.png
    |      smld_db.drawio
    |      smld_db.png
    |      SQL.png
    |
    ├─lib
    |  |  core.py
    |  |  __init__.py
    |  |
    |  ├─config
    |  |      config.py
    |  |      setname_mapping.py
    |  |      __init__.py
    |  |
    |  ├─query
    |  |      query.py
    |  |      __init__.py
    |  |
    |  ├─smld
    |  |      smld.py
    |  |      __init__.py
    |  |
    |  ├─utility
```

```
│   │      types.py
│   │      utils.py
│   │      __init__.py
│   │
│   └─vba
│           caller.py
│           SmldWrangler.xlsm
│           __init__.py
│
├─reports
│      pmod_smld_viz_v0.09.xlsm
│
└─test
        cleaned_headers.py
        df_replace.py
        ext.py
        field_names.py
        mon.py
```

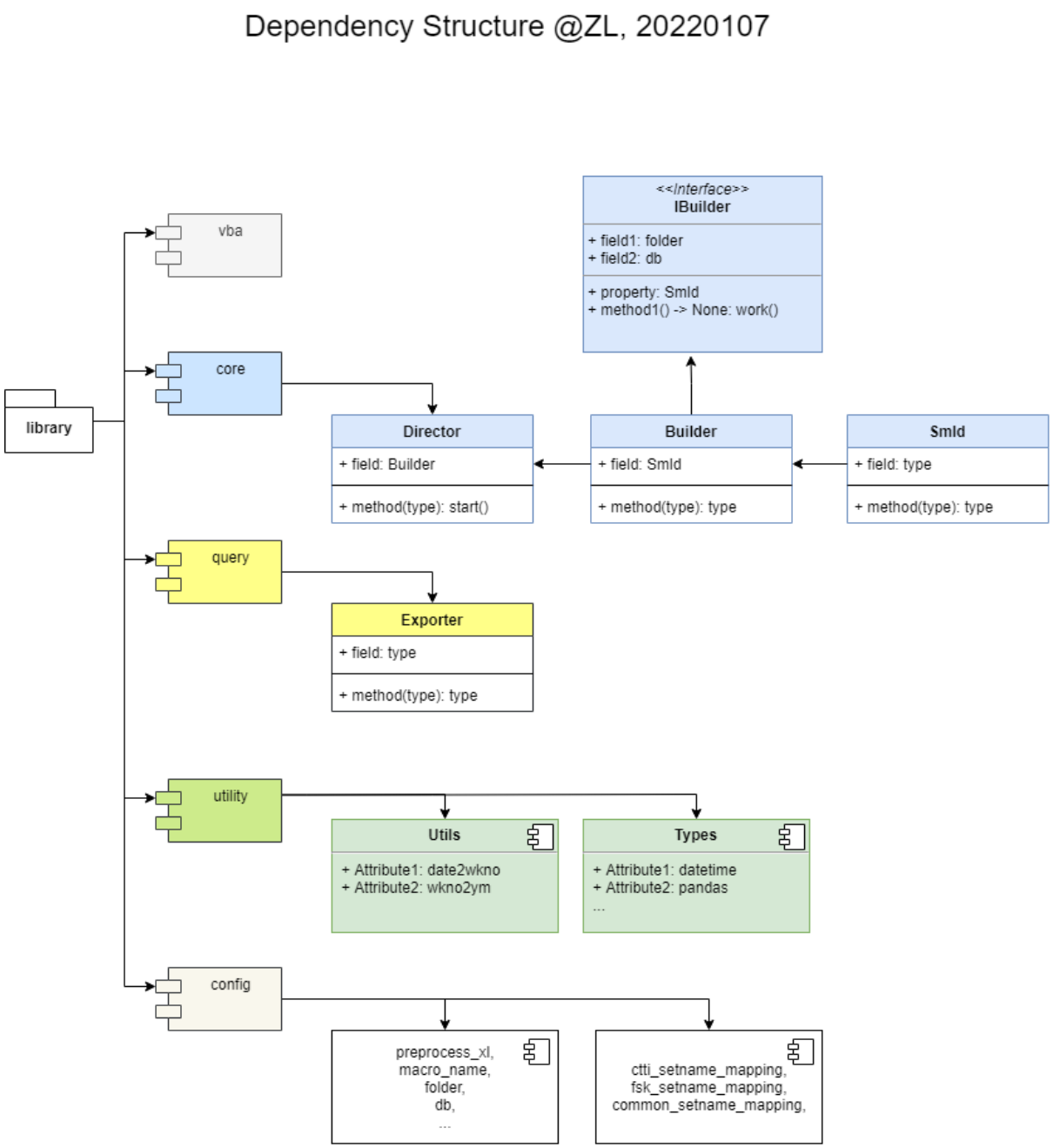
Design pattern

There was an impact to performance when using Python to clean "inputs" data in source files;

After built a VBA class API to preprocess the clean operation, the impact is alleviated;

Pattern

- (Class) using `VBA` preprocess class API to do basic data cleaning;
- (Class) using `Python` + `Pandas` to build a DataFrame Merger API to wrangle the preprocessed source files with split control: "defects", "inputs";
- (Class) using `SQL` to control all data entries and poka-yoke duplicate entries;
- (Class) exports `SQL` database to excel "pmod_smld.xlsx" with unique columns for further data visualization;
- (Module) using `VBA` to visualise pmod smld data;

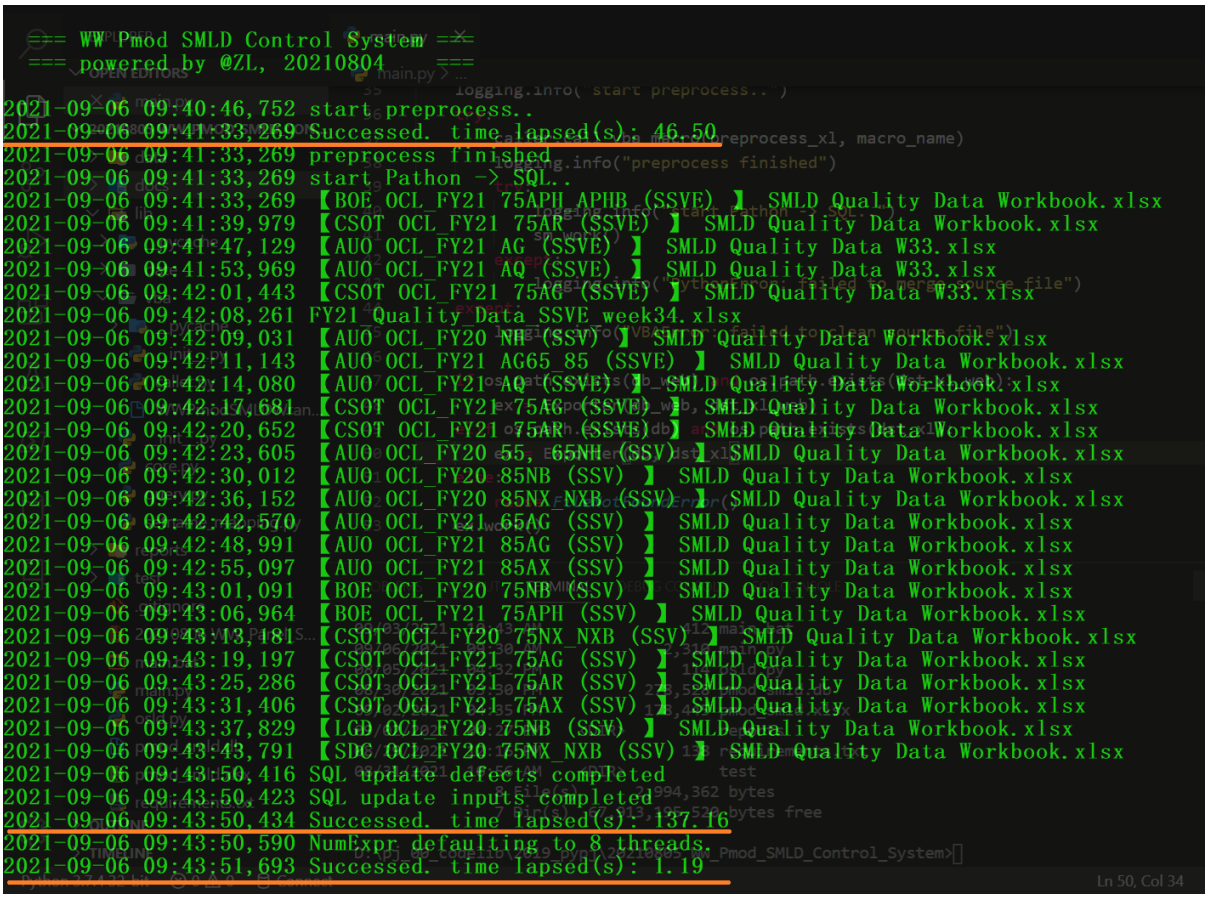


Performance

The average run time of whole process is around 3 minutes.

- preprocess : 46.50 seconds
- python->SQL database : 137.16 seconds
- SQL query : 1.19 seconds

=> Performance: 184 seconds



VBA preprocess class API

```
Option Explicit

Private Sub CPModWrangler()
    Dim FSO As New FileSystemObject
    Dim srcWB As Workbook
    Dim plant As String
    Dim rv As Variant
    Dim cpw As New CPModWrangler
    Dim subDir As Scripting.Folder
    Dim srcFile As Scripting.File
    Const tmp_flag As String = "~$"
    Const xl_flag As String = "xls"
    Dim root As String
    root = FSO.GetParentFolderName(FSO.GetParentFolderName(ThisWorkbook.path)) &
Application.PathSeparator & "data"

    If root = vbNullString And Not FolderExists(root) Then
        MsgBox "DirNotFound", vbInformation, "NotFoundError"
        Exit Sub
    End If

    FastMode True
    'On Error Resume Next
    For Each subDir In FSO.GetFolder(root).SubFolders
        For Each srcFile In FSO.GetFolder(subDir).Files
```

```
            If InStr(srcFile.name, tmp_flag) < 1 And InStr(srcFile.name, xl_flag)
> 1 Then
                Set srcWB = GetObject(srcFile)
                rv = Split(srcWB.FullName, Application.PathSeparator)
                plant = rv(UBound(rv) - 1)
                cpw.init srcWB, plant
                cpw.clean
                Set srcWB = Nothing
            End If
        Next
    Next
    Set FSO = Nothing
    FastMode False
End Sub
```

Python DataFrame Merger API

Using Python to read all preprocessed files, and clean DataFrame further;

```
def main()->None:
    smld = Smld(
        fix_defects_setname=common_defects_setname,
fix_defects_setname_mapping=common_defects_setname_mapping,
        fix_inputs_modelname=common_inputs_modelname,
fix_inputs_modelname_mapping=common_inputs_modelname_mapping,
        fix_inputs_fy=common_inputs_fymod,
fix_inputs_fy_mapping=common_inputs_fymod_mapping,
    )

    b = Builder(folder, db_web)
    b.smld = smld
    d = Director()
    d.builder = b

    logging.info("start preprocess..")
    try:
        caller.call_vba_macro(os.path.abspath(preprocess_xl), macro_name)
        logging.info("preprocess finished")
        try:
            logging.info("start Python -> SQL..")
            d.start()
        except:
            logging.info("PythonError: failed to merge source file")
    except:
        logging.info("VBAError: failed to clean source file")

    if os.path.exists(db_web):
        ex = query.Exporter(db_web, dst_xl_web)
        ex.work()
```

```
    else:
        if os.path.exists(db):
            ex = query.Exporter(db, dst_xl)
            ex.work()
        else:
            raise FileNotFoundError()
```

Usages

The project itself is a well-tested console application.

Usage 1

User may utilize `Python` to interact with "pmod_smld.db";

```
import sqlite3

def dml(db:Path)->None:
    with sqlite3.connect(db) as conn:
        cur = conn.cursor()
        ...
```

Usage 2

User may write the following `command` to run this application if user is familiar with `Batch`;

Either user may click "main.bat" to achieve same effect;

```
@echo off
cd "root of this procject directory"
python main.py
```

Usage 3

If user was familiar with `SQL`, user should use SQLite3 Studio to link "pmod_smld.db".

```
SELECT * FROM defects
WHERE TVPlant = "FSK" AND ConfirmationWC = 2132 AND Classify = "Line"
LIMIT 10;
```

Usage 4

If user was familar with `Excel`, user could use Excel application to manipulate data as well;

```
Public Sub load_src()
    ''' load source data from a given workbook @ZL, 20210825
    Dim beg As Single: beg = Timer

    Dim dstWB As Workbook: Set dstWB = ThisWorkbook
    Dim strSRC As String: strSRC = GetFilePath(ThisWorkbook.path)
    If Not FileExists(strSRC) Or strSRC = vbNullString Then
        Exit Sub
    End If
    Dim srcWB As Workbook: Set srcWB = GetObject(strSRC)

    Const wsn_defects As String = "defects"
    Const wsn_inputs As String = "inputs"

    Dim srcDefects As Worksheet, srcInputs As Worksheet
    Dim dstDefects As Worksheet, dstInputs As Worksheet
    If (Not WSExists(srcWB, wsn_defects)) Or (Not WSExists(srcWB, wsn_inputs))
Then
        MsgBox "WSNotFoundError", vbInformation, "WorkSheetError"
        Exit Sub
    End If

    Set srcDefects = srcWB.Worksheets(wsn_defects)
    Set srcInputs = srcWB.Worksheets(wsn_inputs)
    Set dstDefects = dstWB.Worksheets(wsn_defects)
    Set dstInputs = dstWB.Worksheets(wsn_inputs)

    dstDefects.Cells(1, 1).Resize(srcDefects.UsedRange.Rows.Count,
srcDefects.UsedRange.Columns.Count) = srcDefects.UsedRange.Value
    dstInputs.Cells(1, 1).Resize(srcInputs.UsedRange.Rows.Count,
srcInputs.UsedRange.Columns.Count) = srcInputs.UsedRange.Value

    Const hiddenColumnDefects As String = "V:AC"
    Const hiddenColumnsInputs As String = "G:O"
    dstDefects.Columns(hiddenColumnDefects).EntireColumn.Hidden = True
    dstInputs.Columns(hiddenColumnsInputs).EntireColumn.Hidden = True

    hidde_WS_OldColumns dstWB

    MsgBox "Successed. time lapsed(s): " & (Timer - beg), vbInformation, "Reload"
End Sub
```

About

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