CLOUD COMPUTING FOR DYNAMICALLY UPDATING LAND USE FILE IN SWAT

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Presented at:

SWAT 2015
PULA / SARDINIA / ITALY

- SWAT 2009: released January 2010

- New module inclusion: land use change (LUU)*

- Input files required: lup.dat, file1.dat, file2.dat,….

*Arnold et al. (2010)

**SWAT2009 onwards
Model run 1998 - 2008**

HRU_FR in *.hru

HRU_FR= 0.1 means 10% of subbasin
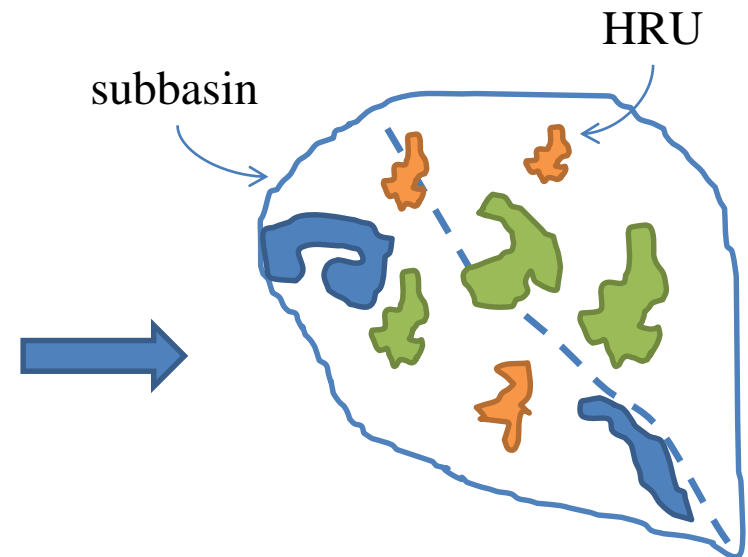
HRU_FR= summation (1)


```
C:\WINDOWS\system32\cmd.exe - swat2009.exe

D:\Grad_Asst_Duties\SWAT_Modeling\Illinois\SWAT_Model\Scenarios\Default\TxtInOut
>swat2009.exe
                    SWAT2009
                    Rev. 414
        Soil & Water Assessment Tool
                   PC Version
Program reading from file.cio . . . executing

    Executing year      1
    Executing year      2
    Executing year      3
    Executing year      4
    Executing year      5
    Executing year      6
    Executing year      7
    Executing year      8
    Executing year      9
    Executing year     10
    Executing year     11
```

HRU

subbasin

UPDATE

- SWAT2009_LUC was developed to create input files for activating LUU module*

- More than 7000 user visits** to SWAT2009_LUC tool have been made since mid 2011.

- Changing either the data path, renaming of folders, land use data format, not checking box against hru feature class etc. have invited lots of questions from users
- Tutorial example is recommended for guidance

*Pai and Saraswat(2011)   ** Google Analytics

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OBJECTIVES

1 Develop a Cloud-based tool using open source software to create lup.dat file for use in SWAT model

2 Demonstrate and Performance Results

Cloud Architecture

SWAT_LUC FILE STRUCTURE

Folders:
- ALLFOLDERS
- CONF
- LOGS
- SITE_MEDIA
- STATIC
- SWAT
- SWATLUC

Django Project

ALLFOLDERS
USER UPLOADED DATA
- SWAT Model
- Landuse Layers
- Landuse Lookup

SITE_MEDIA & STATIC
- Images
- CSS
- JavaScript
- Manuals

SWATLUC
- Python modules
- Views
- Models

CONF
- Django Apache configuration (WSGI) files

LOGS
- Access log
- Error log

SWAT
- Settings
- Urls
- Templates (HTML)
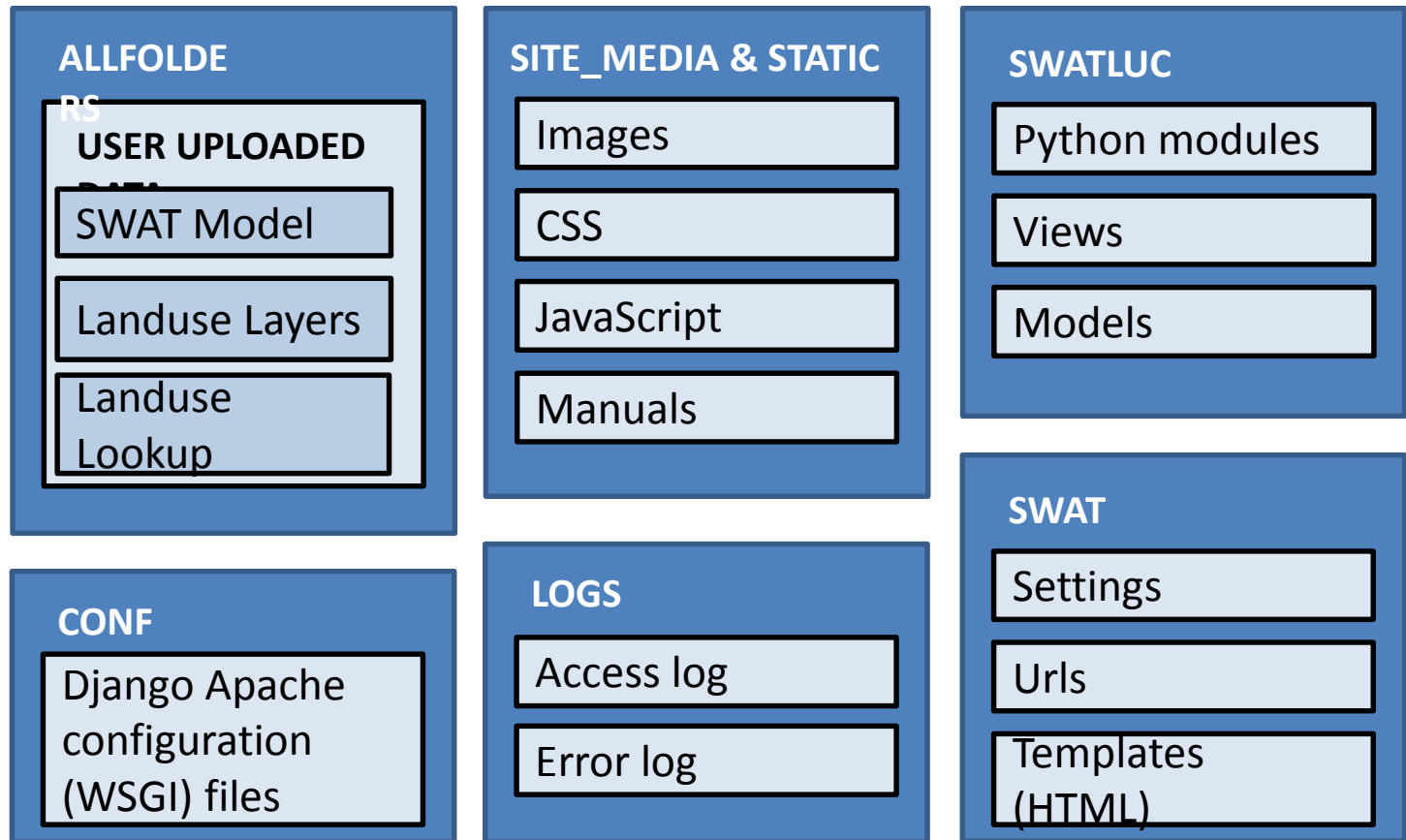
SWAT_LUC TECHNOLOGY STACK
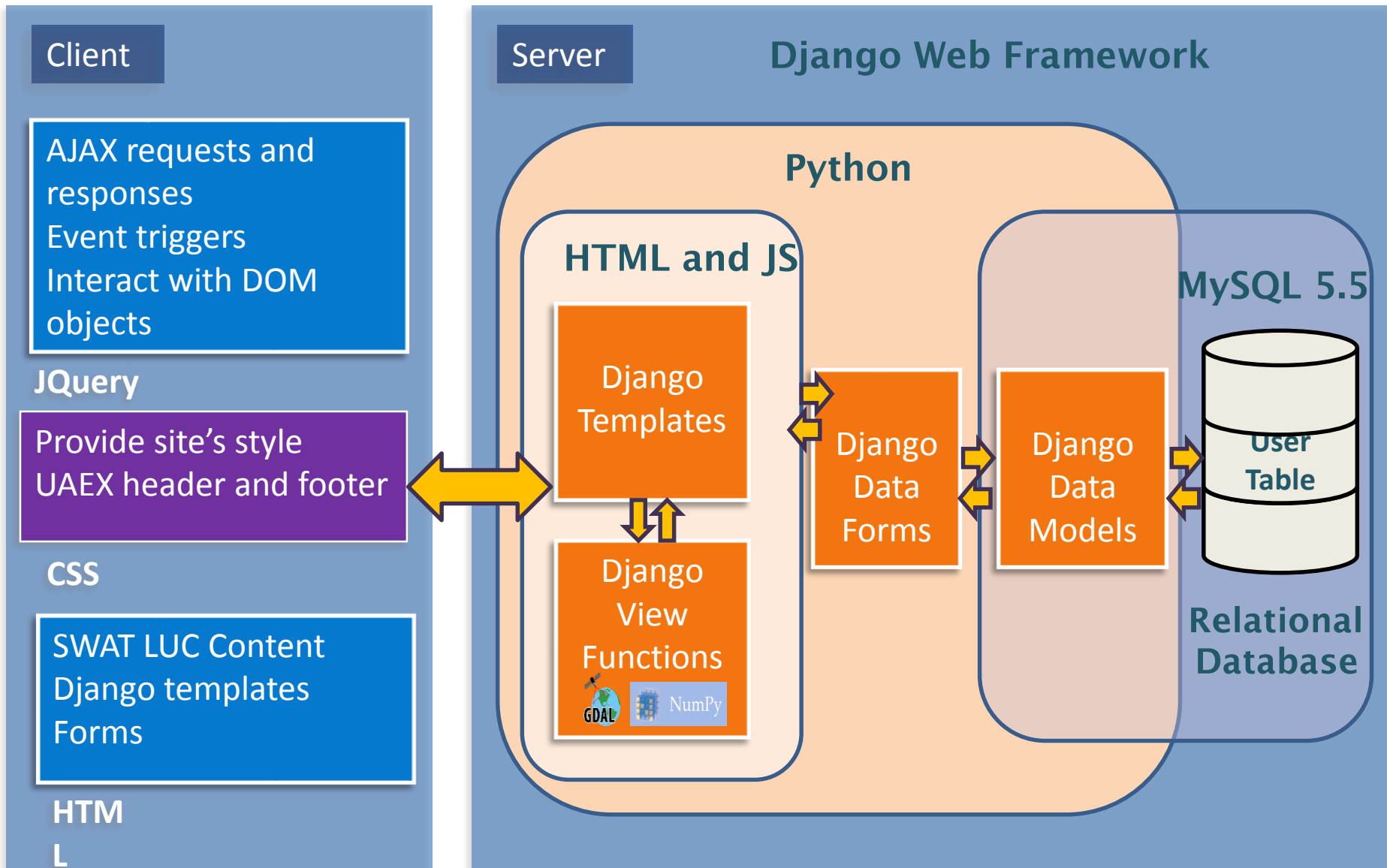
DJANGO USER AUTHENTICATION

- **Manage user objects**

- **Assign permission and authorize requests**

- **Manage administrator accounts**

- **Built-in views for handling login authentication, password encryption, and password resets**

- **Automated password reset through email validation**

Database Schema
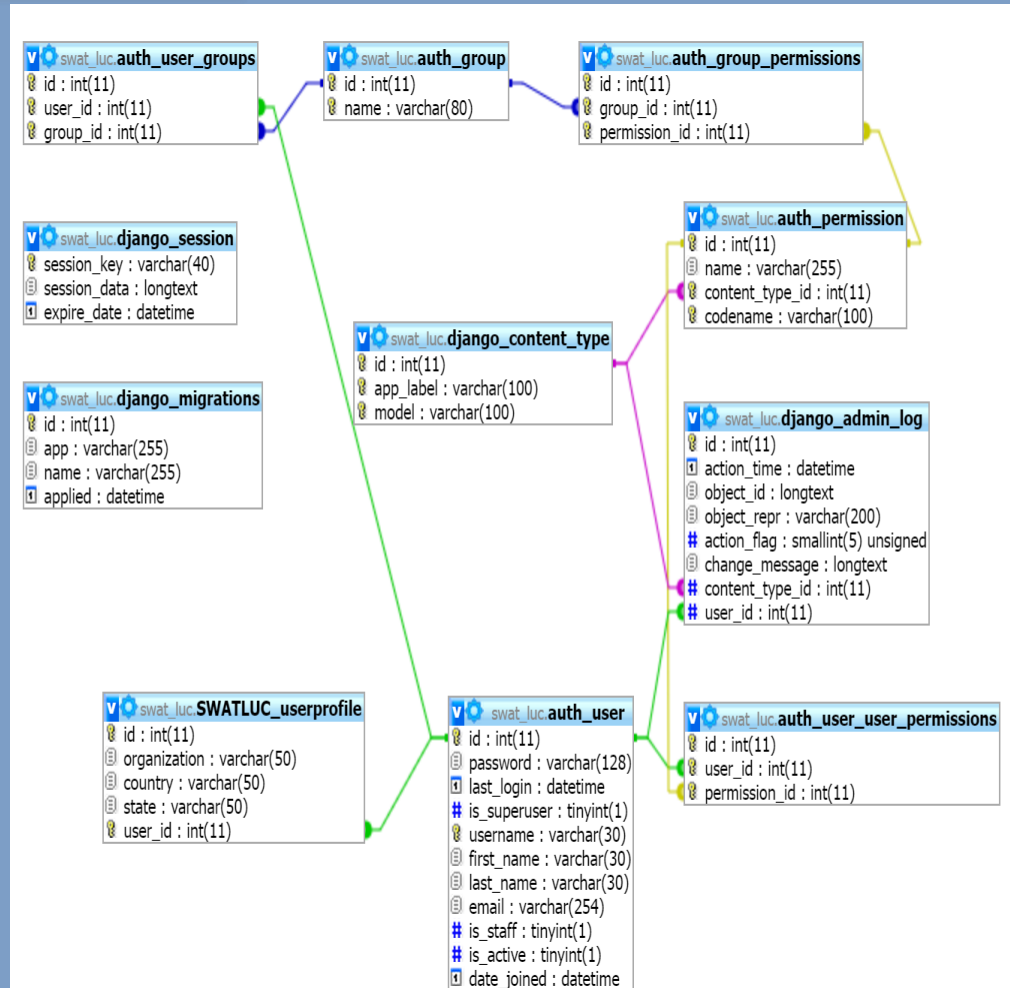
Demonstration and Results

STEP 1. SWAT Project folder input

Goose Creek Illinois River Watershed
(114 Sq km, 1050 HRU)

Cache River Watershed
(5000 sq km, 12321 HRU)

3 Seconds

11 Seconds

STEP 2. Land use layers folder input

Goose Creek Illinois River Watershed
(114 Sq km, 1050 HRU)

Cache River Watershed
(5000 sq km, 12321 HRU)

2 Seconds

4 Seconds

DEMONSTRATION AND PERFORMANCE

STEP 3. Individual land use layers input

Goose Creek Illinois River Watershed
(114 Sq km, 1050 HRU)

Cache River Watershed
(5000 sq km, 12321 HRU)

20 Seconds

90 Seconds

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STEP 4. Land use look up file input

Goose Creek Illinois River Watershed (114 Sq km, 1050 HRU)

Cache River Watershed (5000 sq km, 12321 HRU)

2 Seconds

2 Seconds

STEP 5. Tool run/process time/output download

Goose Creek Illinois River Watershed (114 Sq km, 1050 HRU)

Cache River Watershed (5000 sq km, 12321 HRU)

SWAT Model Input:	Choose File No file chosen	Upload	?	✓
Landuse Folder:	Choose File No file chosen	Upload	?	✓
No. of Landuse layers:		OK	?	✓
Lookup File:	Choose File No file chosen	Upload	?	✓
Reset	Process	Download		

SWAT Model Input:	Choose File No file chosen	Upload	?	✓
Landuse Folder:	Choose File No file chosen	Upload	?	✓
No. of Landuse layers:		OK	?	✓
Lookup File:	Choose File No file chosen	Upload	?	✓
Reset	Process	Download		

Re-creating raster file with merged hrus
hru_area.txt containing hru fractional area is created
Processing lu1 named landuse file
hru fractional area of lu1 is printed
Processing lu2 named landuse file
hru fractional area of lu2 is printed
process complete

Processing cache_04 named landuse file
hru fractional area of cache_04 is printed
Processing cache_06 named landuse file
hru fractional area of cache_06 is printed
Processing cache_11 named landuse file
hru fractional area of cache_11 is printed
process complete

2 Seconds
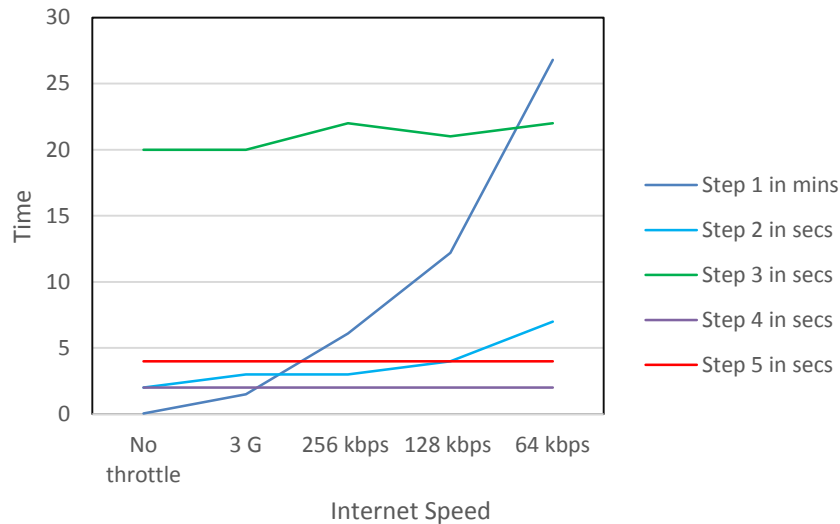
2 minutes 29 Seconds

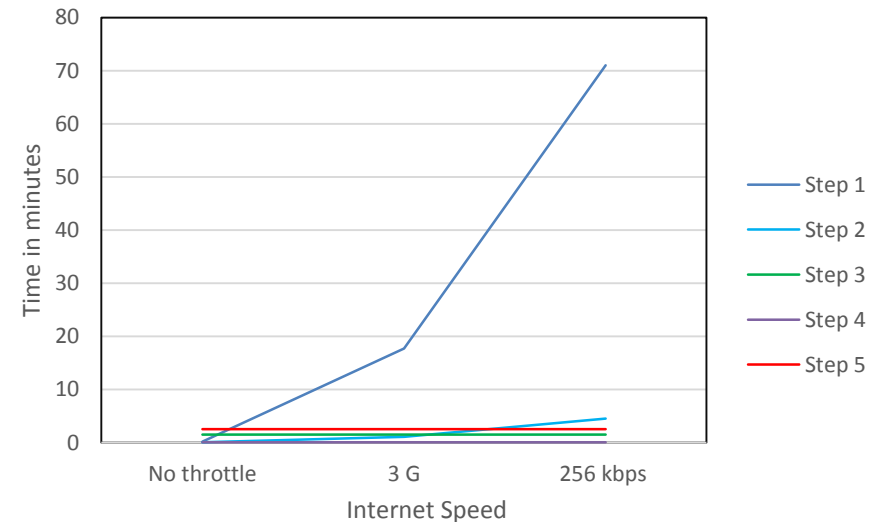Steps 1 to 4 may depend on the internet speed of the user, but step 5 runs on the server.

Overall Performance

Goose Creek Illinois River Watershed
SWAT Project Size 11 mb & #HRUs 1050

Cache River Watershed
SWAT Project Size 128 mb & #HRUs 12321

CONCLUSIONS

✓ Objective 1: SWAT_LUC, a cloud-based tool using open source software was developed

✓ Objective 2: Data upload time varied with size of data and internet speed at the user's end

✓ Output from the tool was independent of the user's internet speed

✓ Additional tools are undergoing testing and will be released at 2015 SWAT Conference organized by Purdue University during 12-16 October, 2015

ACKNOWLEDGEMENTS

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QUESTIONS

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