Advanced Scripting: Running Excel from Lua

Harvesting GT Data from Excel
Scripting: Brief Overview

• Use your own logic to:
  – Create a new, custom output parameter
  – Programmatically set existing model inputs

• Define your own functions, call external programs...

• Thermoflow programs use the open-source scripting language Lua
  – https://www.lua.org/
Script Definition

• Need to define:
  – What it produces:
    • New, custom outputs
    • Choose model input(s) to set
  – What it needs:
    • Model inputs or outputs
  – When it happens:
    • Before calculation begins (initialization / to set inputs once)
    • During the loop (to set inputs each loop)
      – THERMOFLEX only!
    • After convergence (to set inputs after the model converges)
    • After calculation ends (final cleanup / to compute pure outputs)
Example: Harvesting GT Data from Excel

• **Situation:** We have an Excel workbook that computes GT performance as a function of its Compressor Inlet Temperature (CIT). We want to harvest values from this workbook and update our GT MASTER model’s gas turbine during computation.
  
  – **Note:** This same method can be used in GT PRO and THERMOFLEX as well!
Script Plan, Part 1

- **What** will it produce
  Thermoflow Input Parameters (TFIPs)
  1. GT gross power
  2. GT heat rate (LHV)
  3. GT exhaust gas mass flow
  4. GT exhaust gas temperature

- **What** does it need
  Script Input Parameters (SIPs)
  1. Compressor Inlet Temperature
Script Plan, Part 2

• **What** it needs to do:
  1. Launch Excel
  2. Load our workbook
  3. Pass **CIT** to the workbook
  4. Let the workbook compute GT performance
  5. Harvest the GT performance parameters (**GT power**, **heat rate**, and **exhaust gas mass flow** and **temperature**)
  6. Close Excel

• **When** these steps need to be done:
  - Before computation: Steps 1 & 2
  - During computation: Steps 3 – 5
  - After computation: Step 6
Automating Excel

• Excel exposes a COM interface to allow for both in-process and out-of-process automation
  – In-process: VBA
  – Out-of-process: External program running and interacting with Excel
LuaCOM

- [https://github.com/davidm/luacom](https://github.com/davidm/luacom)

- LuaCOM is a library that allows Lua to easily use and create objects that follow Microsoft’s Component Object Model (COM) specification.

- Open source, permissive licensing
Lua for Windows

- [https://github.com/rjpccomputing/luaforwindows](https://github.com/rjpccomputing/luaforwindows)

- Provides many useful libraries when using Lua on Windows, including LuaCOM

- Open source, permissive licensing