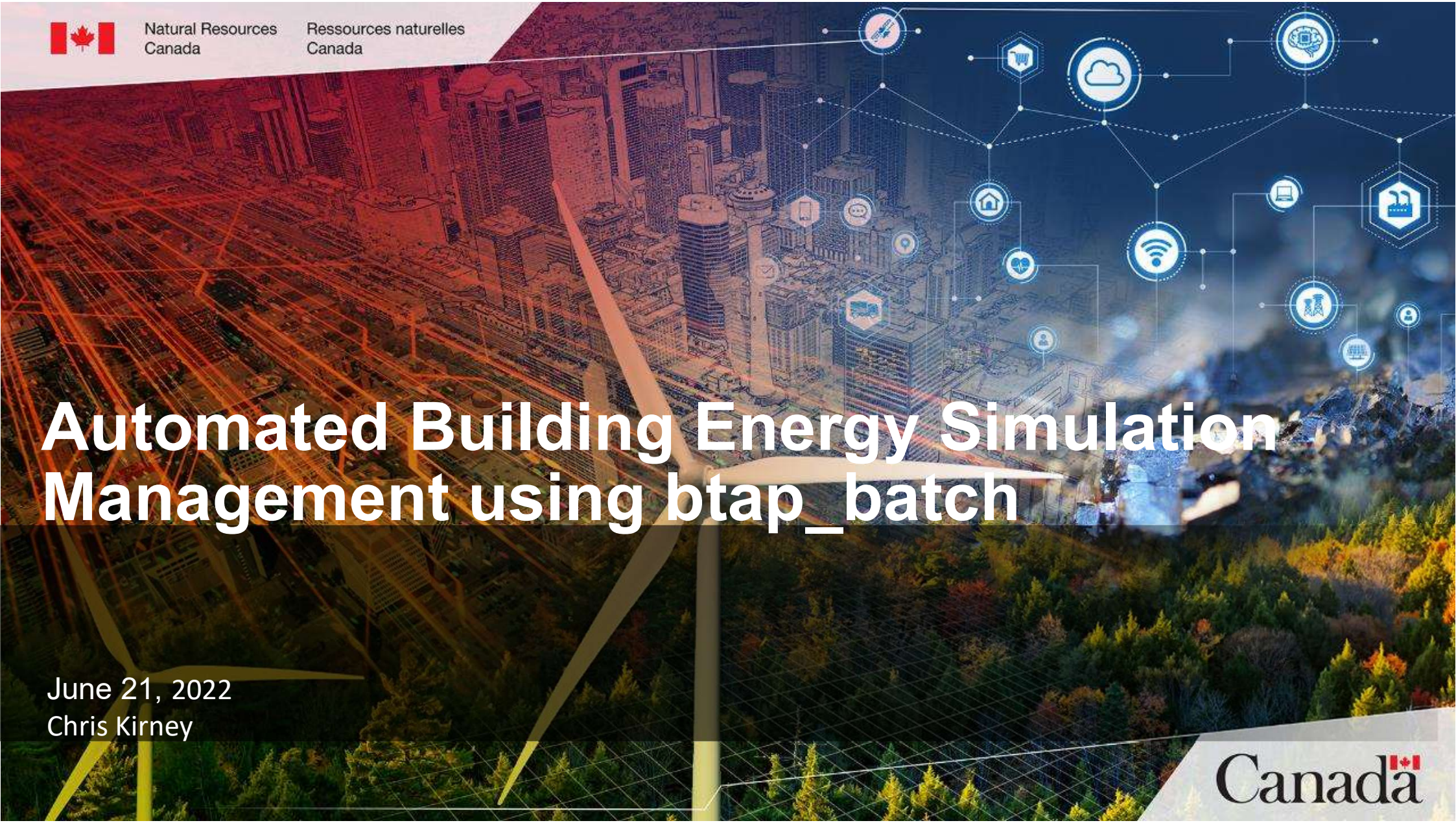

Natural Resources Canada
Ressources naturelles Canada
Automated Building Energy Simulation Management using btap_batch
June 21, 2022
Chris Kirney
Canada

Overview

Purpose

- BTAP originally developed and used as a measure in OpenStudio
- Used the Parametric Analysis Tool (PAT) to conduct analyses involving many simulations
- btap_batch serves a similar function to PAT but has fewer issues with the NRCan IT environment
- Now use btap_batch for all BTAP analyses

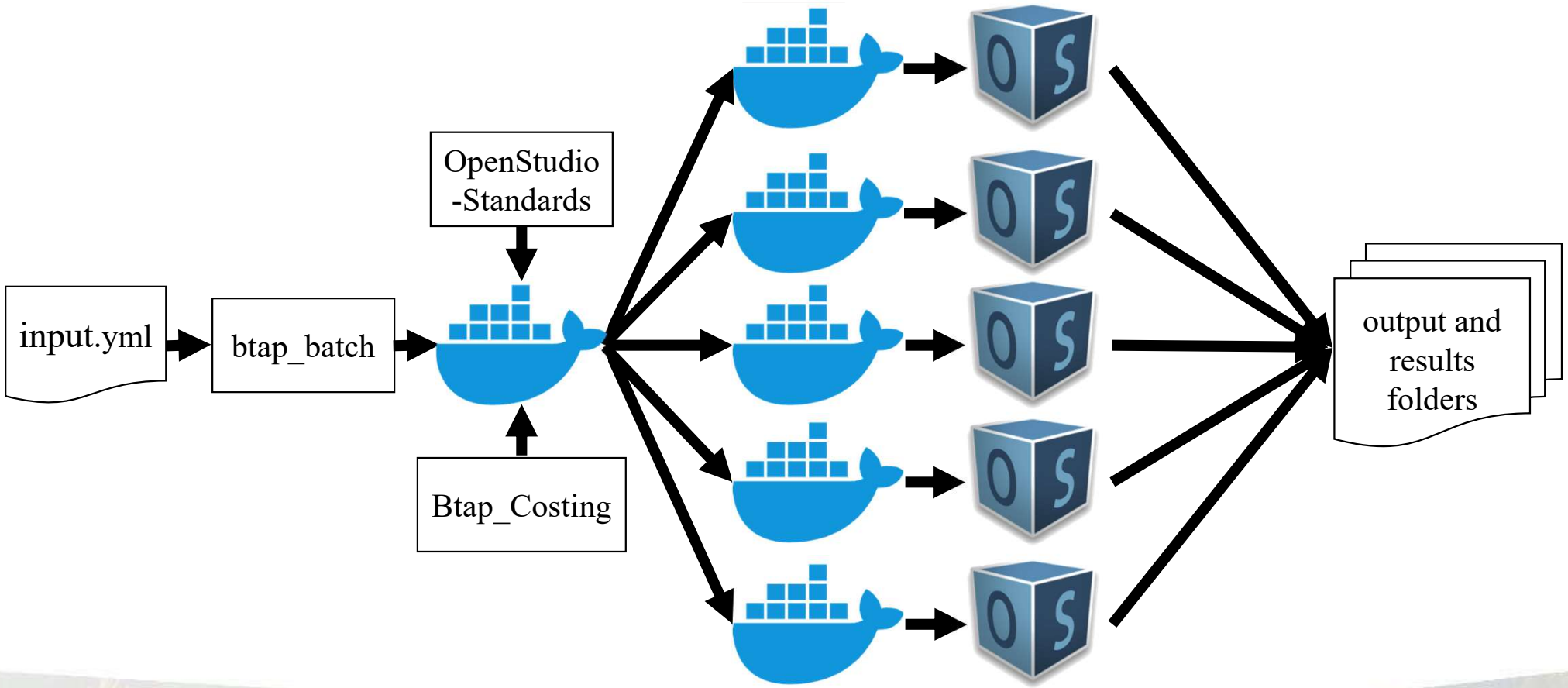
Scale

- Can run smaller analyses locally on a computer
- Can run larger analyses using Amazon Web Services (AWS)
- AWS analyses currently limited to the BTAP team but we are investigating support for use with other AWS accounts

btap_batch analyses:

- Parametric, optimization, elimination, sensitivity, etc.
- Create NECB 2011, NECB 2015, NECB 2017, and existing building reference building models and existing buildings
- Can Use measures included in BTAP
- Shortly others will be able to use costing if they have an RSMeans account

How Does btap_batch work?

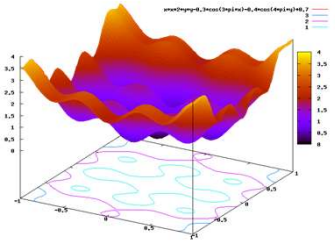


Analysis Control

input.yml

- All of the options for an analysis are defined here
- Broken into:
  - analysis_configuration
  - building_options
- analysis_configuration: Controls what analysis is done and how
- Building_configuration: Controls the characteristics of the buildings that are modeled

analysis_configuration



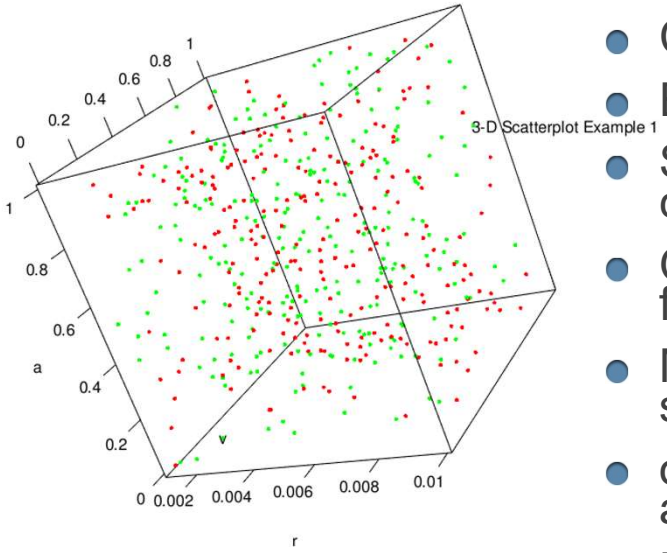
- Location of run (AWS/local)
- Which version of OpenStudio-Standards and btap_costing is used?
- Which version of OpenStudio is used?
- Do you want a costing?
- Do you want a reference run?
- Run type and settings (parametric, optimization, lhs, etc.)
- Do you want hourly data (if so which)?

building_configuration

- Building type(s)
- Weather location(s)
- Code(s)
- Primary heating fuel(s)
- Envelope characteristics
- HVAC equipment type
- HVAC equipment efficiency
- Photovoltaics
- Loads

For more information see
btap_batch/resources/BTAPOptions.xlsx

examples folder

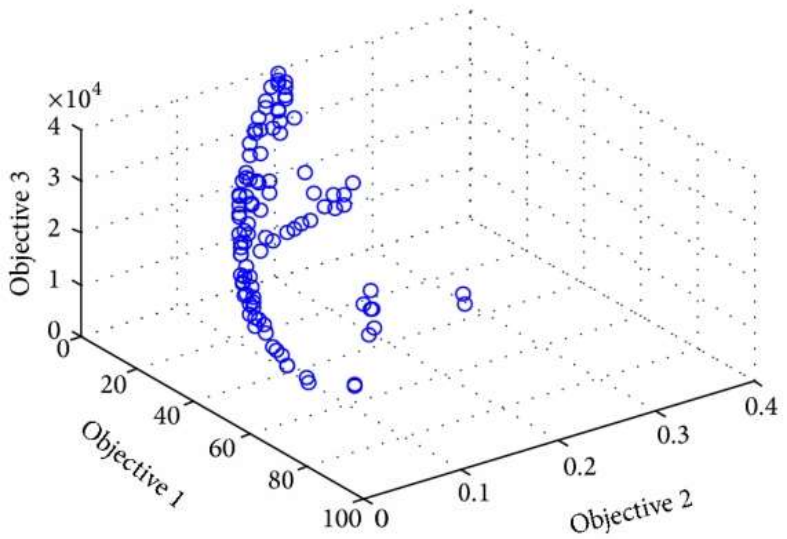


Same code is used for all examples folder analyses. Only input.yml changes (and an additional folder in one case):

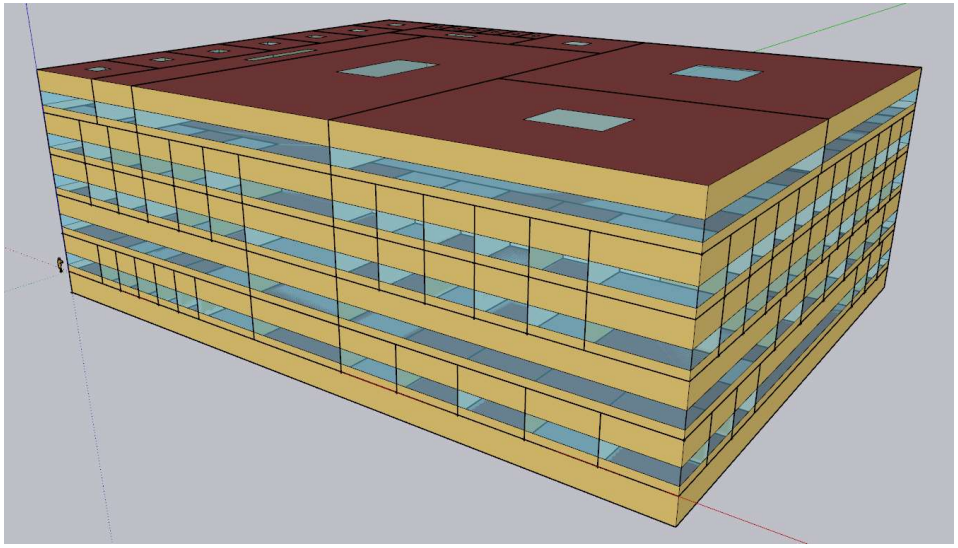
- Custom_osm: Parametric analysis using a custom OpenStudio Model
- Elimination: In turns, minimize each operation and envelope U-value
- Sensitivity: Look at extremes of one parameter while holding others constant
- Optimization: Uses nsga2 optimization (can choose objective functions)
- Multi_analyses/IDP (Integrated Design Process): Runs elimination, sensitivity, and optimization
- osm_batch: Simulate a given set of OpenStudio models (no changes applied)
- Parametric: Simulate all combinations of building_options
- Sample-lhs: Simulate a combinations of building_options chosen using latin hypercube sampling

Analysis Output

- Each analysis is given a long string of characters (hash) in addition to the name you choose
- Output stored in a folder named after analysis hash
- Analysis folder contains 3 subfolders:
  - Input
  - Output
  - Results



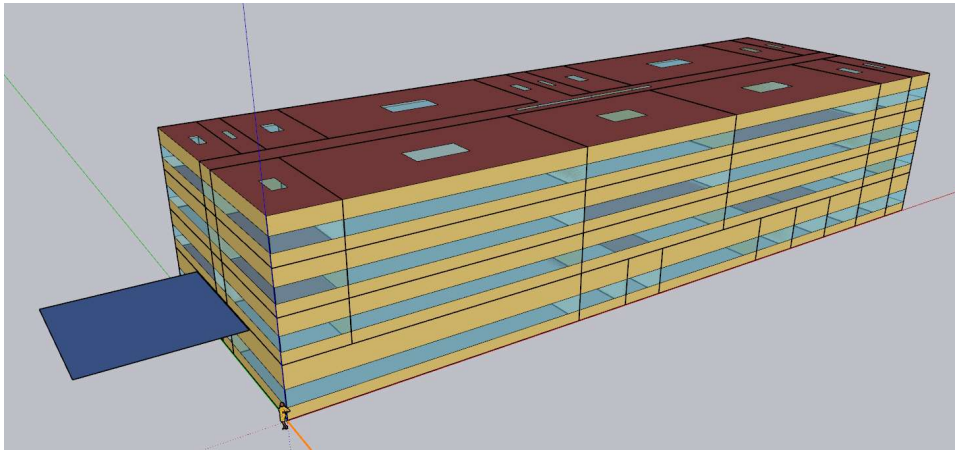
Input and Output Folders



- Each simulation is given its own hash
- Input and output folders each contain many subfolders named after their corresponding simulation hash
- Input folder contains OpenStudio models and run_options selected for each simulation
- Output folders contain OpenStudio and EnergyPlus files and folders
- Output folders also contain other output files including btap_data.json and qaqc.json
- Both files contain similar data
- qaqc.json contains some more outputs but in a format that is difficult to import into analysis tools

Results folder

- Database folder: summarized results for each simulation
- Eplustbl.htm folder: EnergyPlus results report for each simulation
- Failures: Error messages from any failed simulations (ideally should be empty)
- Hourly.csv: contains hourly results for hourly result variables selected in input.yml file
- in.osm: All OpenStudio models simulated
- Output.xlsx: Summarized results of entire analysis (all files in database folder collected together)



Acknowledgments & Questions

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