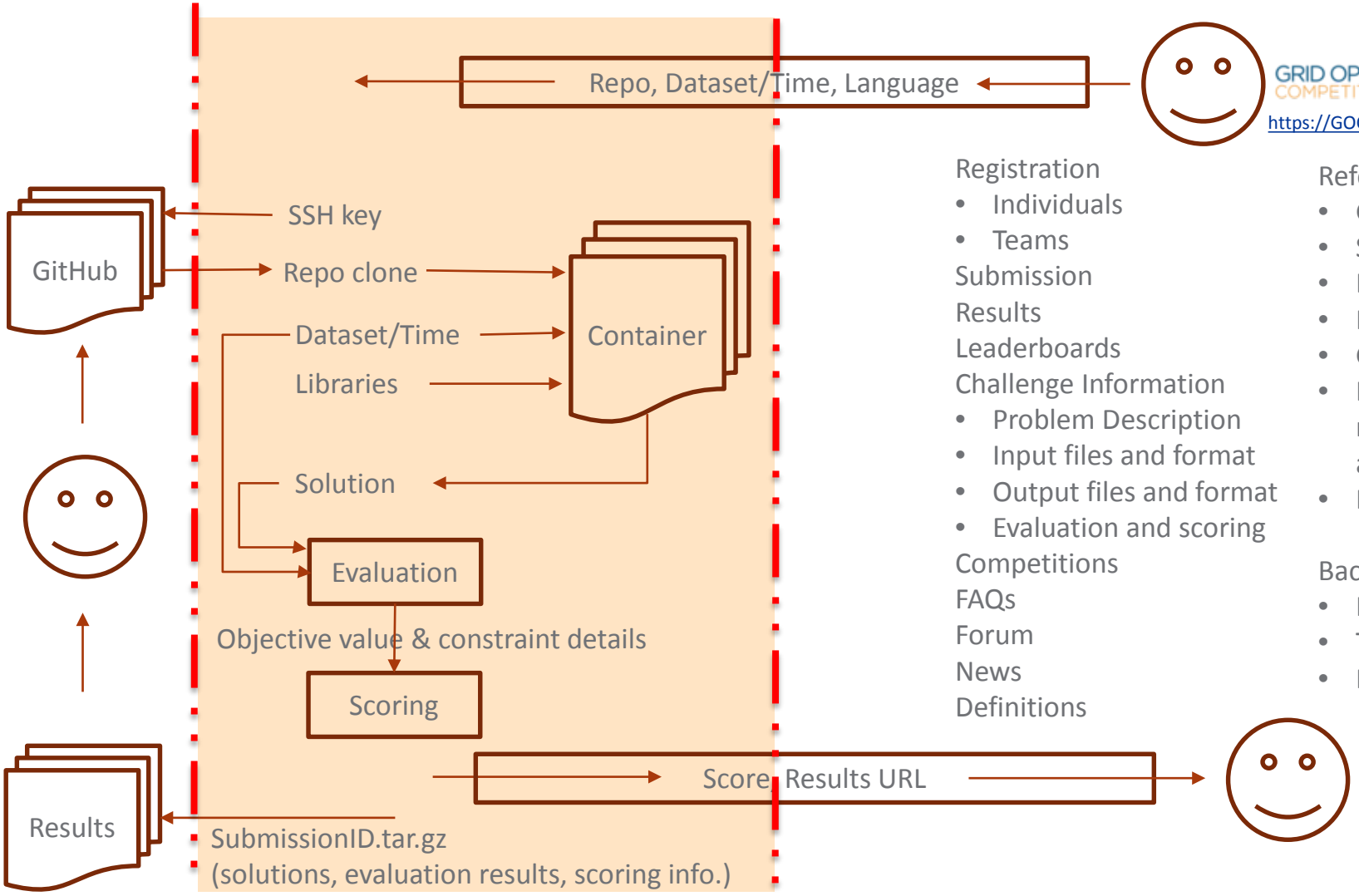
Grid Optimization (GO) Competition Platform Interaction and Entry Submission

STEPHEN ELBERT

Webinar 2

February 21, 2019, 12:00 pm ET

Competition Platform Components



GRID OPTIMIZATION (GO) COMPETITION

https://GOCompetition.Energy.Gov

Registration
- Individuals
- Teams

Submission

Results

Leaderboards

Challenge Information
- Problem Description
- Input files and format
- Output files and format
- Evaluation and scoring

Competitions

FAQs

Forum

News

Definitions

References
- Getting started
- Solvers
- Languages
- Platform
- GitHub
- How to register; create a team; submit
- Rules

Background
- Inspiration
- Timeline
- Prizes

Preparing to Submit—your environment

- Download available datasets
  - Sandbox (easy starting point)
  - Challenge 1 Original Datasets 1 & 2
  - Trial 1, 2 and Final datasets will not be available ahead of time
- Create Code 1
  - Runs with 10 (Real-time) or 45 (Offline) minute time limit
  - Creates solution1.txt (base case)
- Create Code 2
  - Longer time limit
  - Creates solution2.txt (contingency solution)
- Score solution files with https://github.com/GOCompetition/Evaluation

- Code invocation syntax on Languages page
  https://gocompetition.energy.gov/languages

Preparing to Submit as Entrant

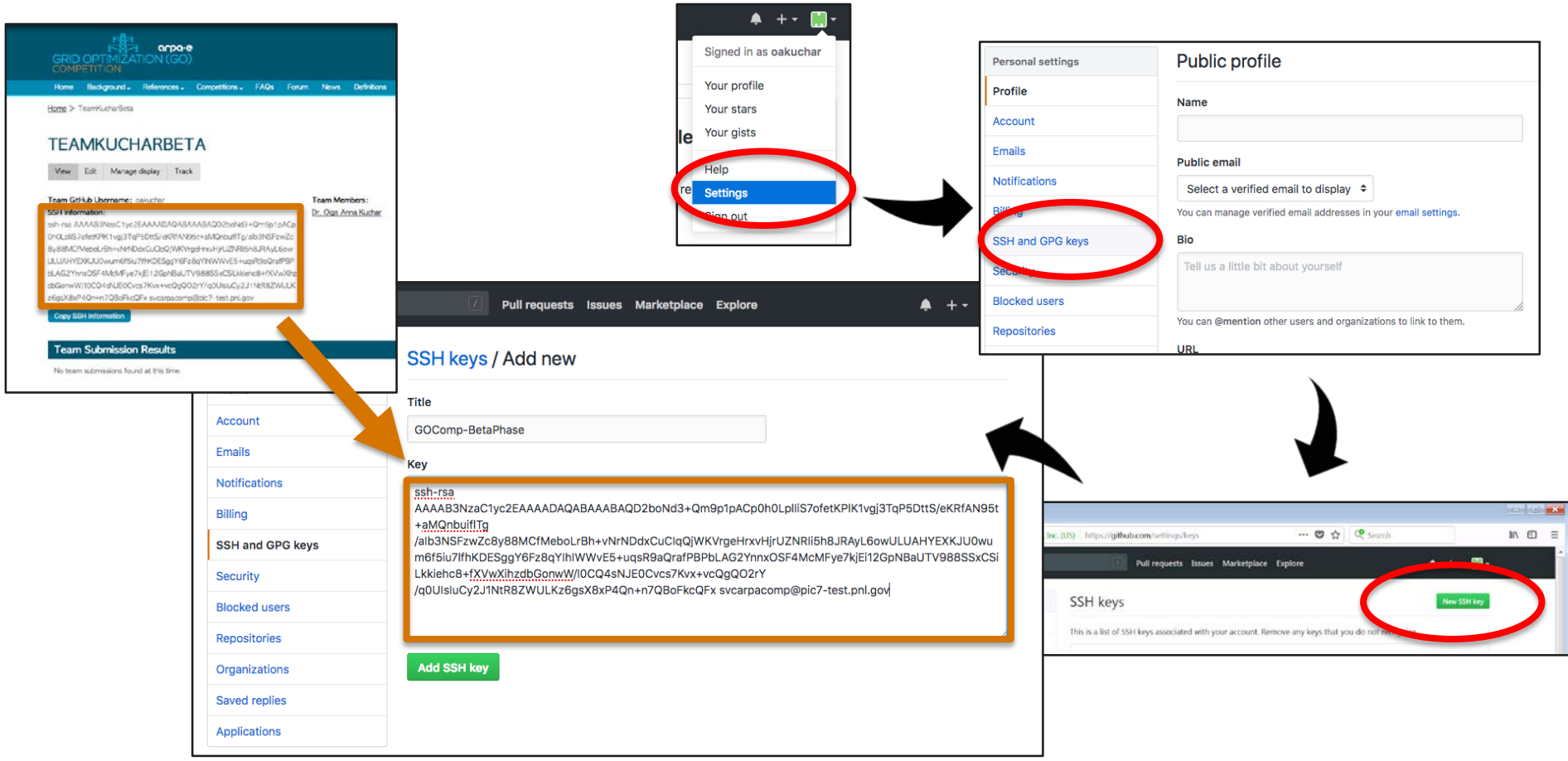
- Account Registration
  - Individuals
  - Team
    - GitHub username
    - Install SSH Key
    - Create repo with Code1, Code2, and submission.conf (if relevant; versioning, MPI)
- Eligibility, Documents for ARPA-E, and Platform Access
  - Registration Approval (via ARPA-E) → Sandbox submission
  - Sandbox qualification → Challenge 1 submission

Setting the GitHub SSH Key

- Your team will be assigned an SSH key on the Team accountpage
  - Enter just the username, not http:/github.com/username
  - The username is not case sensitive but the entry on the team page is because of the SSH Key
  - SSH (Secure Shell) keys are an access credential that are used in the SSH protocol
  - SSH keys are an authentication method used to gain access to an encrypted connection between systems
  - Allows the GO Competition platform to securely connect and download a team's submission code
  - https://gocompetition.energy.gov/github-and-go-competition

- Copy the team's SSH key (you can use the convenient copy button)
- Log in to your team's account on GitHub
- Go to Settings under your Public Profile icon
  - Icon is in the top-right navigation menu and "Settings" is in the drop-down list
- Go to "SSH and GPG keys" in the left menu bar or https://github.com/settings/keys
- Click on the "New SSH key" green button located at the top right of the SSH keys page
  - Create a title for your key (for example, GO Competition SSH key)
  - Paste the SSH text from the GO Competition Portal Team page into the Key text box
  - Click "Add SSH key" button
- Your new key is added to your SSH Key list and you are ready to test a GO Competition submission

GitHub SSH Key Diagram



Software Environment

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Languages

https://gocompetition.energy.gov/languages

- Input Parameters
- Submission.conf
- C/C++
- GAMS
- Julia/JuMP
- Java/Scala
- Python
- MATLAB/MATPOWER
- Linux binary executables

Solver Libraries

https://gocompetition.energy.gov/available-solvers

- CPLEX
- CVX
- GAMS
- Gurobi
- Ipopt
- MATLAB/MATPOWER
- Mosek
- PowerWorld
- Siemens PSS®E

See website for current versions and restrictions
If you need something not currently provided, contact
arpacomp@pnnl.gov

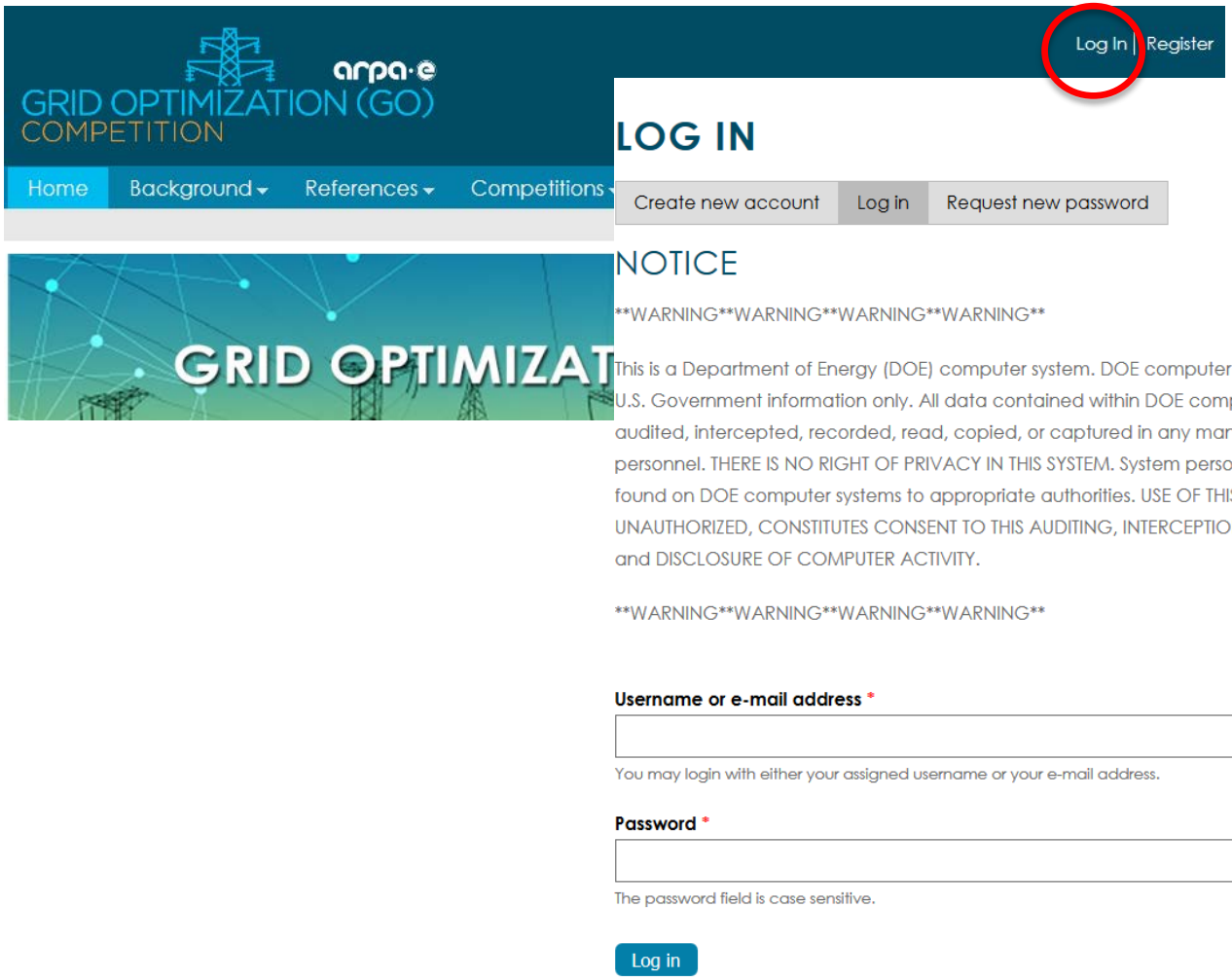
Resources

- Challenge specific
  - Problem Definition
  - Input Files and Format
  - Output Files and Format
  - Evaluation
  - Scoring
  - Leaderboard
- Background
  - Inspiration
  - Timeline
  - Prizes
  - About
- Stay in Touch
  - FAQs
  - Forum
  - News
  - Definitions
- General References
  - Getting Started
  - Available Solvers
  - Languages
  - Evaluation Platform Information
  - GitHub
  - How to
    - Register
    - Create a Team
    - Make a Submission
  - Rules

Items in red: check website frequently for updates!

Initial Entrant Submission

- Login



Review Account Page

At this point you should have generated, signed, and uploaded all the proper forms and they have been approved by ARPA-E.

Home » Steve Elbert

STEVE ELBERT

View | Edit | Subscriptions

ARPA-E REGISTRATION FORMS

INSTRUCTIONS:

Click the **Edit** box above and review your website My Account page for any missing required information before you proceed with any registration steps below.

YOUR AVAILABLE FORMS:

Team Member - Download and sign this form, and then make an electronic image (via scan or photograph) in PDF format. Send this form to your Team Leader.

Generate and Download Entrant Registration: PDF

Team Leader - download and sign this form, and then make an electronic image (via scan or photograph) in PDF format. Collect all of your team member's signed PDF forms. ***Merge all member's forms into one single PDF file. This will be your Team Registration packet****. Upload it to the GO Competition website.*

Generate and Download Team Registration (Team Lead Only): PDF

Team Leader - download, fill-in change team information, and sign this form if you are ***making any changes to your team's official registration after you have been approved by ARPA-E****. Changes can be in team members, team name, anonymous or prize settings, etc. Once you have filled out the form appropriately, upload the* ***Team Change Form PLUS an updated Team Registration packet*** *to ARPA-E for change approval.*

Generate and Download Team Change Form (Team Lead Only): PDF

YOU MUST RETURN YOUR SIGNED FORMS TO PARTICIPATE IN CHALLENGE 1:

Upload your signed and scanned forms. You may not make any submissions until the signed forms are received and approved by ARPA-E.

VIEW FORM STATUS:

You can view the status of your uploaded forms.

Edit Information if Necessary

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User Information

Organization: PNNL

Position: staff

Address:

Richland, WA 99352

United States

Phone Number: +1

Mobile Phone Number: +1

Citizenship(s):

United States

Programming Languages: python

Account and Team Information

Display name: GOComp

Status: Active

Created date: 2018 Mar 23 09:06:23 PDT

Last login: 2019 Feb 18 14:40:56 PST

Team:

GOComp

ALL citizenships must be given on penalty of disqualification

Personal Submission Results

No personal submissions found at this time.

Go to Competition/Sandbox
https://fog-dev.pnl.gov/challenges/sandbox

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Home » Competitions » Sandbox

Sandbox

Datasets

Submit

SANDBOX

The Sandbox provides Entrants the opportunity to become familiar with the competition platform: formats for input and output files, algorithm submission, evaluation, and scoring. The links on this page provide information about the original Beta datasets that have been converted to Challenge 1 format and are accessible through the Sandbox submission. See Challenge 1 for full descriptions of the formulation, file formats, evaluation and scoring.

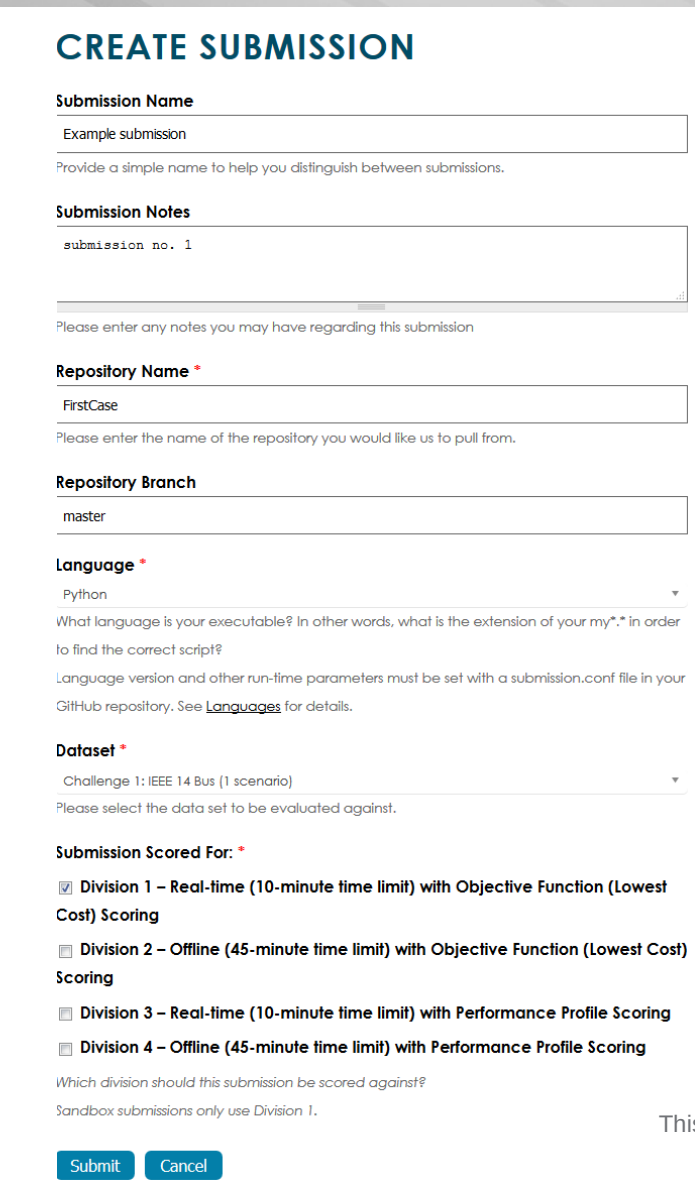
Please be aware that the problem description, input and output formats, datasets, evaluation, and scoring change for each Challenge of the competition, generally becoming more difficult.

There are no prizes associated with use of the Sandbox; it is for testing purposes only.

Click on the Submit button.

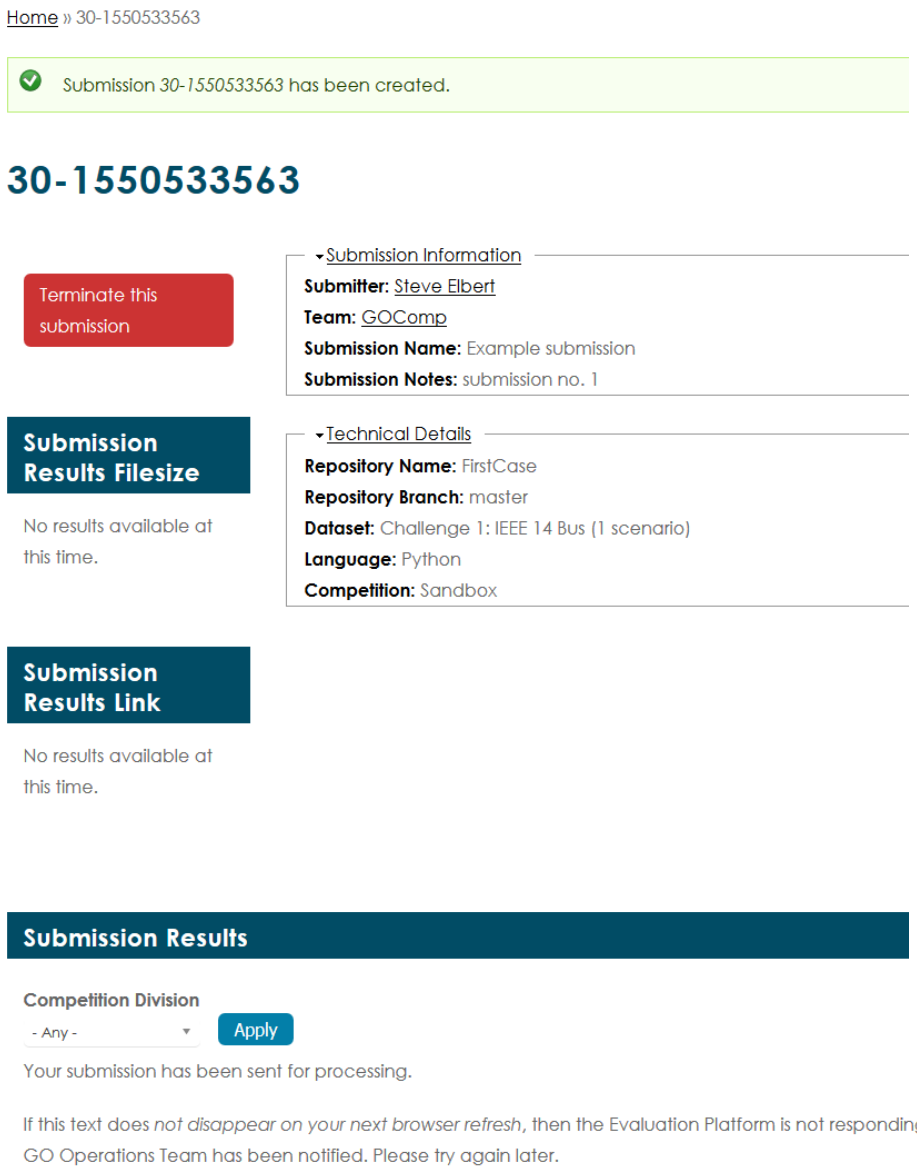
If you don't see the blue Submit button, you have not been approved to submit!

Creating a Submission (Sandbox)



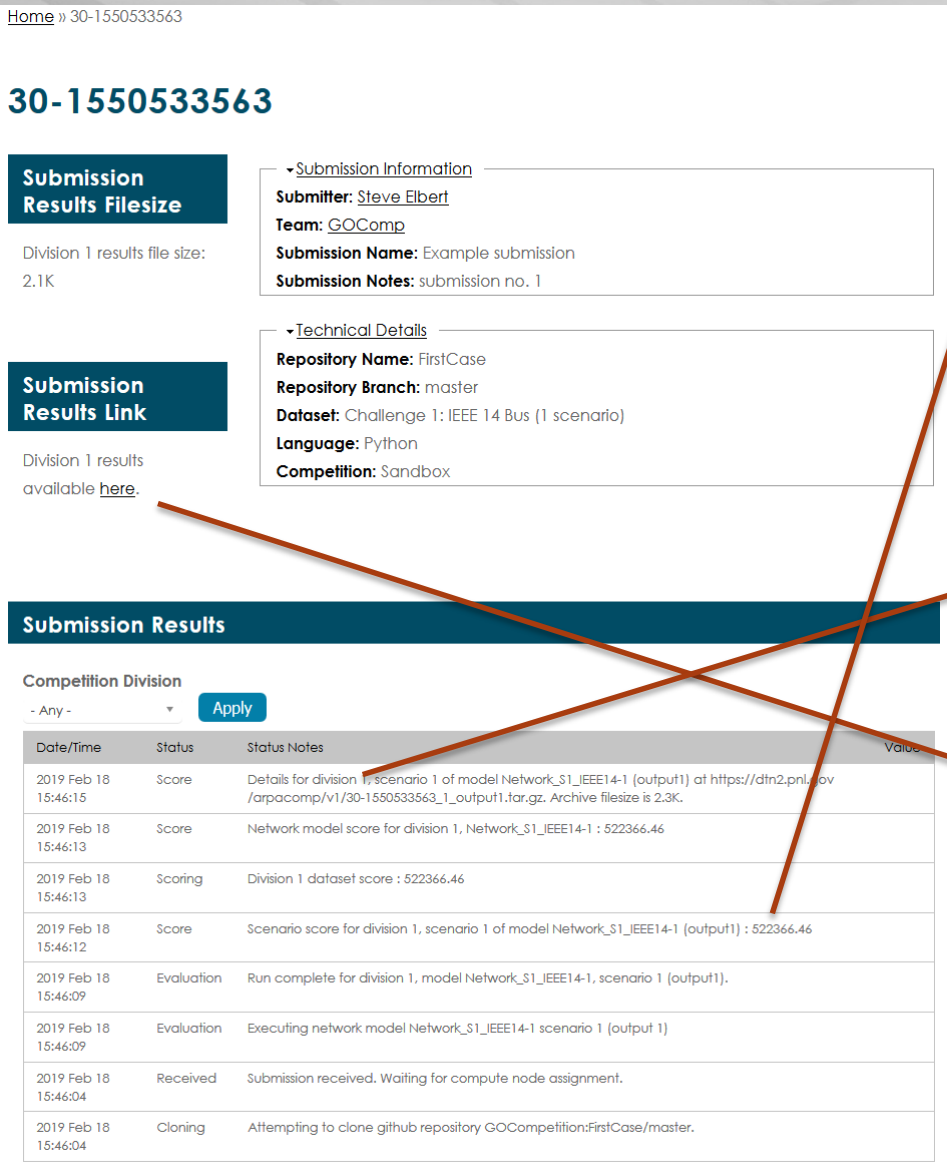
- Enter a submission name
- Enter any notes associated with this submission
- Enter your team's GitHub Repository name
- Enter your team's GitHub Repository branch (master is default)
- Select a language environment (CPP, Executable, GAMS, Java/Scala, Julia, MATLAB, Python)
- Select a dataset
  - Challenge 1: IEEE 14 Bus (1 scenario)
  - C1_OD1_RT_N01_s01
  - C1_OD1_RT_N03_s01
- Select scoring division
  - Only Division 1 for Sandbox
- Click Blue Submit button

Submission Results page (upon submission)



- Submission ID (30-1550532323) is used to track the submission
- The Red Terminate button does just that! (but not for T1, T2, Final)
- Submission Information box
- Technical Details box
- Filesize box (no info until done)
- Results Link box: where to get results
- Results log
  - Select which division results to view
  - Sometimes there is a slight delay in communicating with the back end

Submission Results page (upon completion)



- From bottom up; order variable
- Cloning—check correctness
- Error if proper codes not found
- Evaluation start; complete
- Scenario Score: 522,366.46
  - Good score is 14,677.02
- Network model score (same)
- Dataset score (same)
- (each) Scenario details link
  - Solution files
  - DetailedSolution.csv results
- Results link
  - Summary score.csv
  - Messages.txt
  - Output* (each scenario)
    - Messages.log
    - DetailedSolution.csv
    - Log files
    - Solution_size.txt
    - Evaluation log (feasibility.err)

Results tar file contents

- Output1, Output2, …
- 30-1550533563_SM1_messages.txt

30-1550533563_DIV1: Executing network model Network_S1_IEEE14-1 scenario 1 (output 1)
30-1550533563_DIV1: Run complete for division 1, model Network_S1_IEEE14-1, scenario 1 (output1).
30-1550533563_DIV1: Scenario score for division 1, scenario 1 of model Network_S1_IEEE14-1 (output1) : 522366.46
30-1550533563_DIV1: Network model score for division 1, Network_S1_IEEE14-1 : 522366.46
30-1550533563_DIV1: Division 1 dataset score : 522366.46

- 30-1550533563_SM1_Score.csv

Scenario	Score	Objective	Cost	Penalty	Max_Obj_Viol	Max_Non_Obj_Viol
Network_S1_IEEE14-1 Scenario 1 (output1)	522366.4628	522366.4628	150936.791	371429.6718	0.209133375	0
Network model score for Network_S1_IEEE14-1	522366.4628					
Score for Dataset Challenge_1_IEEE14_1_Scenario	522366.4628					

Infeasibility	Missing/Bad Solution	Slack Objective	Evaluation Duration (sec)	Code1 (sec)	Code2 (sec)
FALSE	FALSE	126164621.2	0.016803026	0.12890699	0.038966285

Tar/output1 contents

- 30-1550533563_messages.log
  - Mon Feb 18 15:46:08 PST 2019 Evaluation Executing network model Network_S1_IEEE14-1 scenario 1 (output 1)
- 30-1550533563_SM1_Network_S1_IEEE14-1_1_DetailedSolution.csv
- feasibility.err (Evaluation log)
- MyPython1.log
- MyPython2.log
- solution_size.txt
  - solution1.txt 535
  - solution2.txt 600

Interpreting Results: DetailedSolution.csv

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ctg	infeas	pen	cost	obj	vmax-idx	vmax-val	vmin-idx	vmin-val	bmax-idx	bmax-val	bmin-idx	bmin-val
	0	195205.9857	150936.791	346142.7768	1	0	1	0	1	0	1	0
LINE-6-12-BL	0	176223.6861	0	522366.4628	1	0	1	0	1	0	1	0

pbal-idx	pbal-val	qbal-idx	qbal-val	pgmax-idx	pgmax-va	pgmin-idx	pgmin-val	qgmax-idx	qgmax-va	qgmin-idx	qgmin-val
3	0.193396284	6	0.020487062	(3, '1')	0	(3, '1')	0	(3, '1')	0	(3, '1')	0
6	0.194654075	2	0.056978264		0		0	(3, '1')	0	(3, '1')	0

qvg1-idx	qvg1-val	qvg2-idx	qvg2-val	lineomax-	lineomax-	linedmax-	linedmax-	xfmromax	xfmromax	xfmrdmax	xfmrdmax
	0		0	(1, 5, 'BL')	0.209133	(1, 5, 'BL')	0.201754	(4, 9, 'BL')	0	(4, 9, 'BL')	0
(3, '1')	0	(3, '1')	0	(1, 5, 'BL')	0.031053	(1, 5, 'BL')	0.030476	(4, 9, 'BL')	0	(4, 9, 'BL')	0

Column header definitions are defined on the Evaluation page
https://gocompetition.energy.gov/challenges/challenge-1/evaluation

Evaluation Log

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Attempting to open /export/submission-manager/data//Challenge_1_IEEE14_1_Scenario/Network_S1_IEEE14-1//inputfiles.ini
Attempting to open /export/submission-manager/data//Challenge_1_IEEE14_1_Scenario/Network_S1_IEEE14-1//inputfiles.ini
Attempting to open /export/submission-manager/data//Challenge_1_IEEE14_1_Scenario/Network_S1_IEEE14-1//inputfiles.ini
Attempting to open /export/submission-manager/data//Challenge_1_IEEE14_1_Scenario/Network_S1_IEEE14-1//inputfiles.ini
Scoring Method:1
Model:/export/submission-manager/data//Challenge_1_IEEE14_1_Scenario/Network_S1_IEEE14-1/
Scenario:/export/submission-manager/data//Challenge_1_IEEE14_1_Scenario/Network_S1_IEEE14-1//scenario_1
Output:/export/submission-manager/submission-manager-tmp//GOCompetition/30-1550533563_1//output1
RAW:/export/submission-manager/data//Challenge_1_IEEE14_1_Scenario/Network_S1_IEEE14-1//scenario_1/case.raw
ROP:/export/submission-manager/data//Challenge_1_IEEE14_1_Scenario/Network_S1_IEEE14-1//scenario_1/case.rop
CON:/export/submission-manager/data//Challenge_1_IEEE14_1_Scenario/Network_S1_IEEE14-1//scenario_1/case.con
INL:/export/submission-manager/data//Challenge_1_IEEE14_1_Scenario/Network_S1_IEEE14-1//scenario_1/case.inl

read data time: 0
buses: 14
loads: 11
fixed_shunts: 1
generators: 5
nontransformer_branches: 17
transformers: 3
areas: 1
switched_shunts: 0
generator inl records: 5
generator dispatch records: 5
active power dispatch records: 5
piecewise linear cost functions: 5
contingencies: 1
set data scalars: 0.000000
set data bus params: 0.000035
set data load params: 0.000538
set data fxsh params: 0.000304

num gen in service: 5, out of service: 0
set data gen params: 0.000293
set data line params: 0.000569
set data xfmr params: 0.000470
set data swsh params: 0.000199
set data gen cost params: 0.000135
set data ctg params: 0.000026
set data time: 0.002618
sol1 read time: 0.003186
set sol1 time: 0.000482
eval cost time: 0.000046
eval line pow time: 0.000050
eval xfmr pow time: 0.000070
eval bus pow balance time: 0.000095
compute detail time: 0.000039
eval penalty time: 0.000113
eval base time: 0.000506
total base case time: 0.006910

ctg eval log

ctg done	ctg to go	t elapsed	t per ctg	t to go
0	1	1.50e-05	na	na

eval ctg time: 0
eval total time: 0
obj: 522366.462823
cost: 150936.791022
penalty: 371429.671801
max_obj_viol: 0.209133
max_nonobj_viol: 0.000000
infeas: 0

obj < slack_objective and infeas == 0
Slack
Objective:126164621.202038
Solutions generated:True
Objective:522366.462823
Cost:150936.791022
Penalty:371429.671801
Infeasibility:0
Max Obj Violation:0.209133
Max non-Obj Violation:0.000000
Eval runtime:0.016803
Code 1 runtime:0.128907
Code 2 runtime:0.038966285
Score:522366.462823

Team page

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GOCOMP

View | Edit

CHALLENGE SUBMISSIONS

Request access to Challenge 1 submissions after demonstrating successful Sandbox submission.

Ask for C1 submission access

GitHub Information

Team GitHub Username: GOCompetition

SSH Key:

ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQ...

Copy SSH Information

Team Information

Team Leader: Steve Elbert

Team Members:

Steve Elbert

Created date: Mon, 03/26/2018 - 11:35

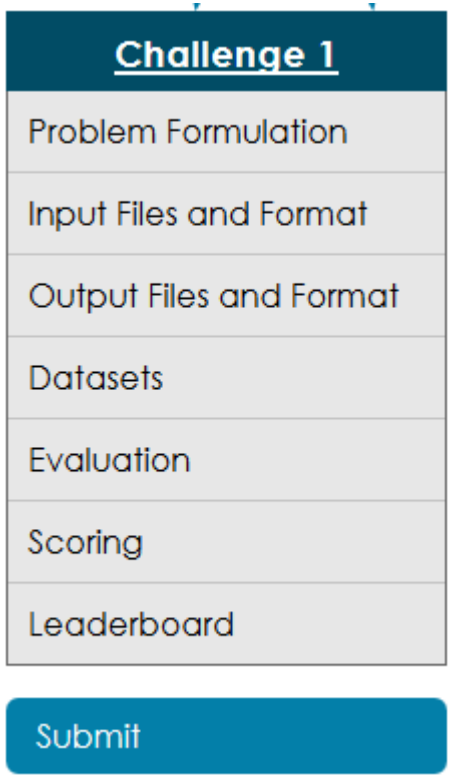
Last modified: Wed, 11/21/2018 - 16:00

Team Submission Results

Date/Time	Submission	Source	Repository	Language	Dataset	Status	Division	Score
2019 Feb 18 15:46:03	**Example submission** (30-1550533563) submission no. 1	Sandbox	FirstCase	Python	Challenge 1: IEEE 14 Bus (1 scenario)	Score	1	522366.46

Lists all submissions by all team members

Challenge 1 Submission



- Complete a successful Sandbox run
  - Generate valid solution files
- Request link on Team page
- Access to Challenge 1 submissions
  - Submit button visible
- Develop algorithm on Sandbox version of OD1 datasets
  - C1_OD1_RT_N01_s01 = Network_01 scenario 1
  - C1_OD1_RT_N03_s01 = Network_03 scenario 1
- Unless code exploits Div 3, 4, only use Div 1,2 for development
- Trial 1, 2 and Final all 4 Divisions run
- Only ONE submission for T1, T2, Final

Questions?