

Grid Optimization (GO) Competition Challenge 1

Webinar: Introduction and Summary

February 5, 2019

This webinar is being recorded for instructional purposes.

Grid modernization requires software development modernization

▶ Modern Grid Challenges and New Opportunities for software

- Increased variability / stochasticity from wind and solar, distributed energy resources
- Decreasing stability and validity of steady state assumptions
- Decentralization / millions of distributed assets
- Power flow controllers



- Storage
- Responsive demand

Competition: Identify breakthrough technologies & initiate overhaul of legacy management systems via a fair and transparent evaluation of innovative approaches

Fast evolving grid requires innovation in management systems / decision support tools

Deterministic



**Stochastic / Model
Uncertainty**

Thousands of Assets



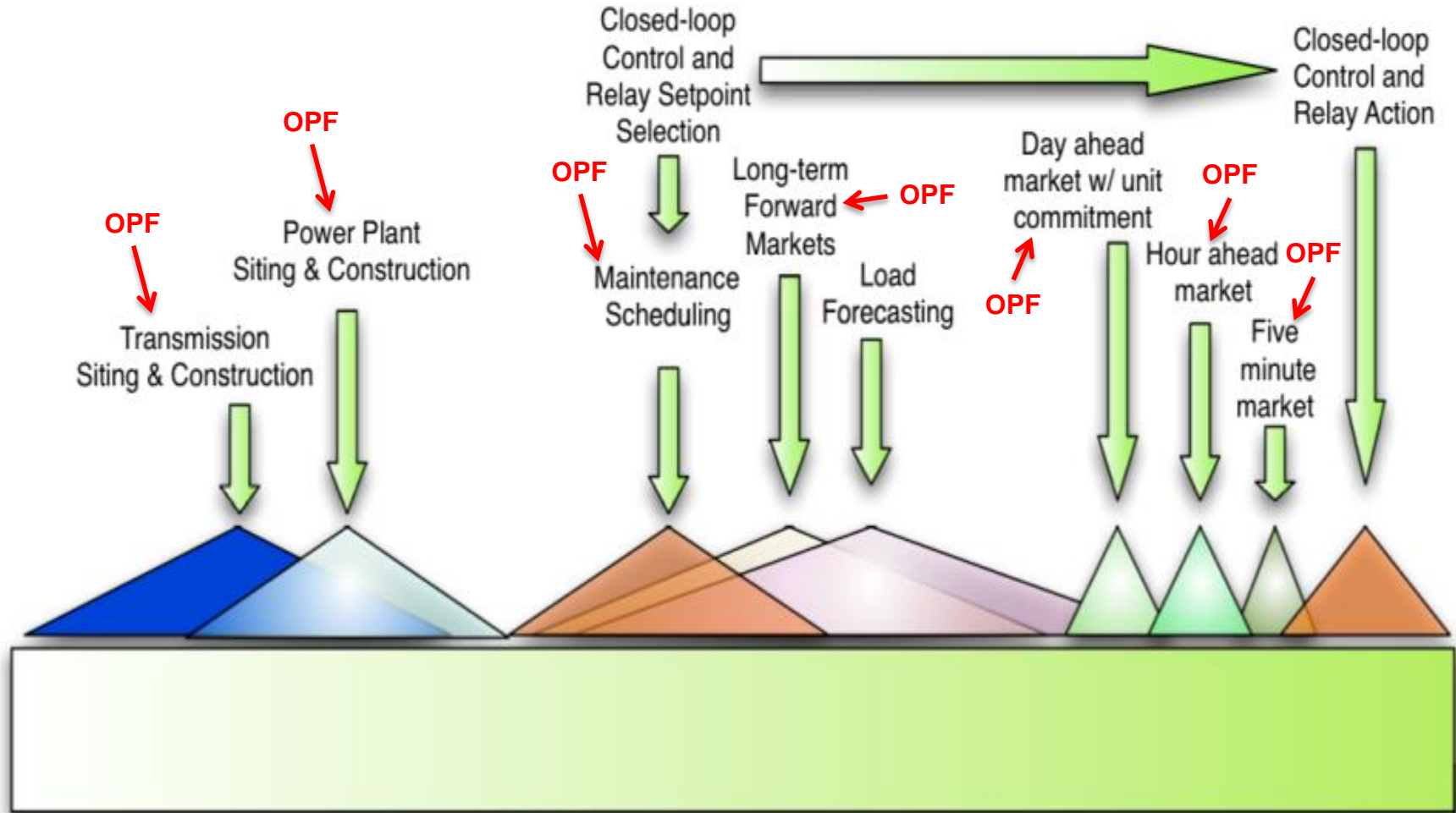
**Millions of Flexible
Assets / Resources**

**Limited / Passive
Power Flow Controllers**



**Dynamically Updated
Power Flow Controllers**

The heart of most grid software/optimization is Optimal Power Flow (OPF)



15 years

10 years

5 years

1 year

1 month

1 week

1 day

5 minute

seconds

3

Software Environment

Languages

- ▶ C/C++
- ▶ GAMS
- ▶ Julia/JuMP
- ▶ Java/Scala
- ▶ Python
- ▶ MATLAB/MATPOWER

- ▶ Linux binary executables

Solver Libraries

Sponsored

- ▶ GAMS
- ▶ Gurobi
- ▶ CPLEX
- ▶ MOSEK

Open Source

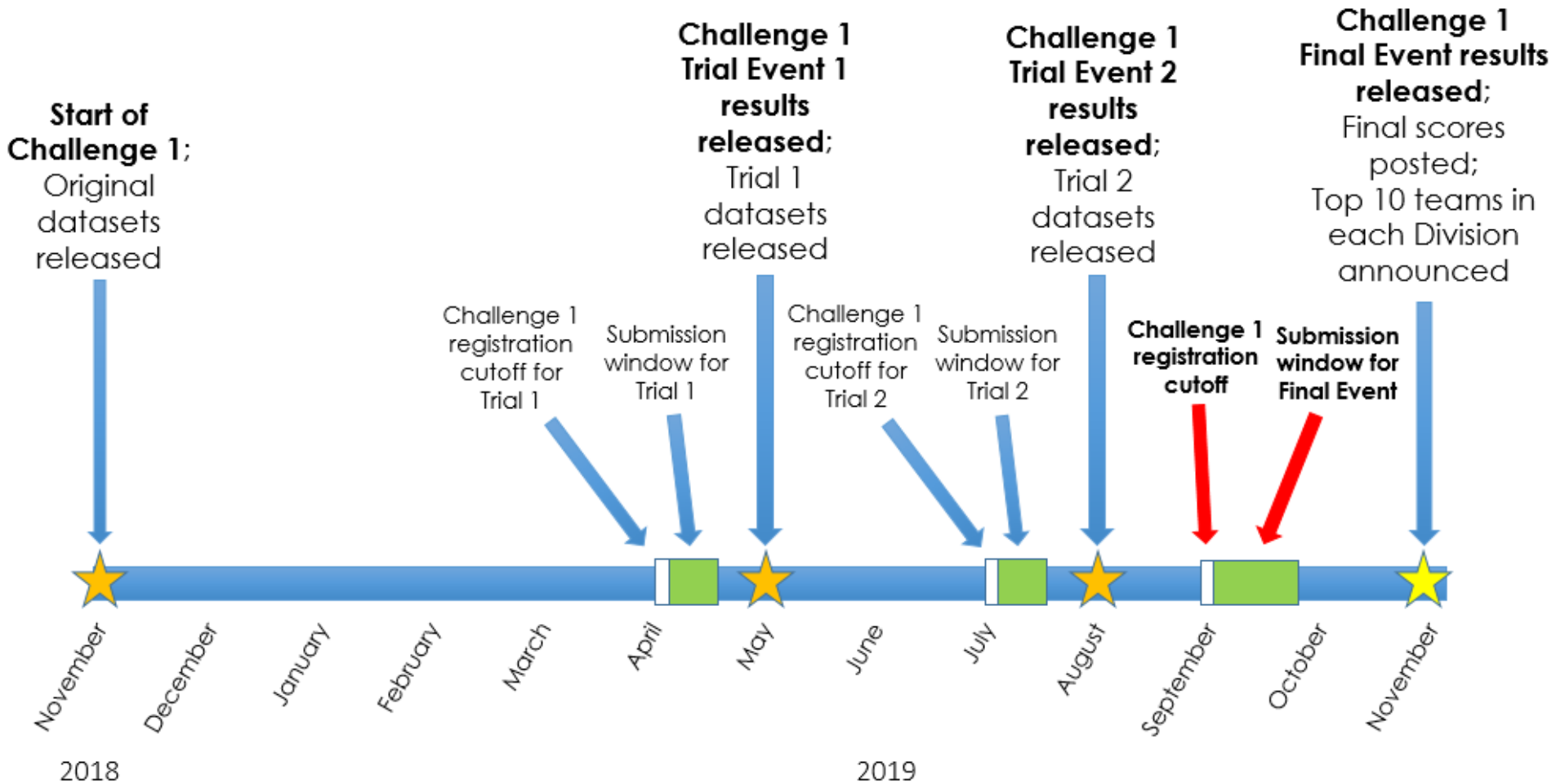
- ▶ CVX
- ▶ Ipopt
- ▶ MATPOWER

Licensed

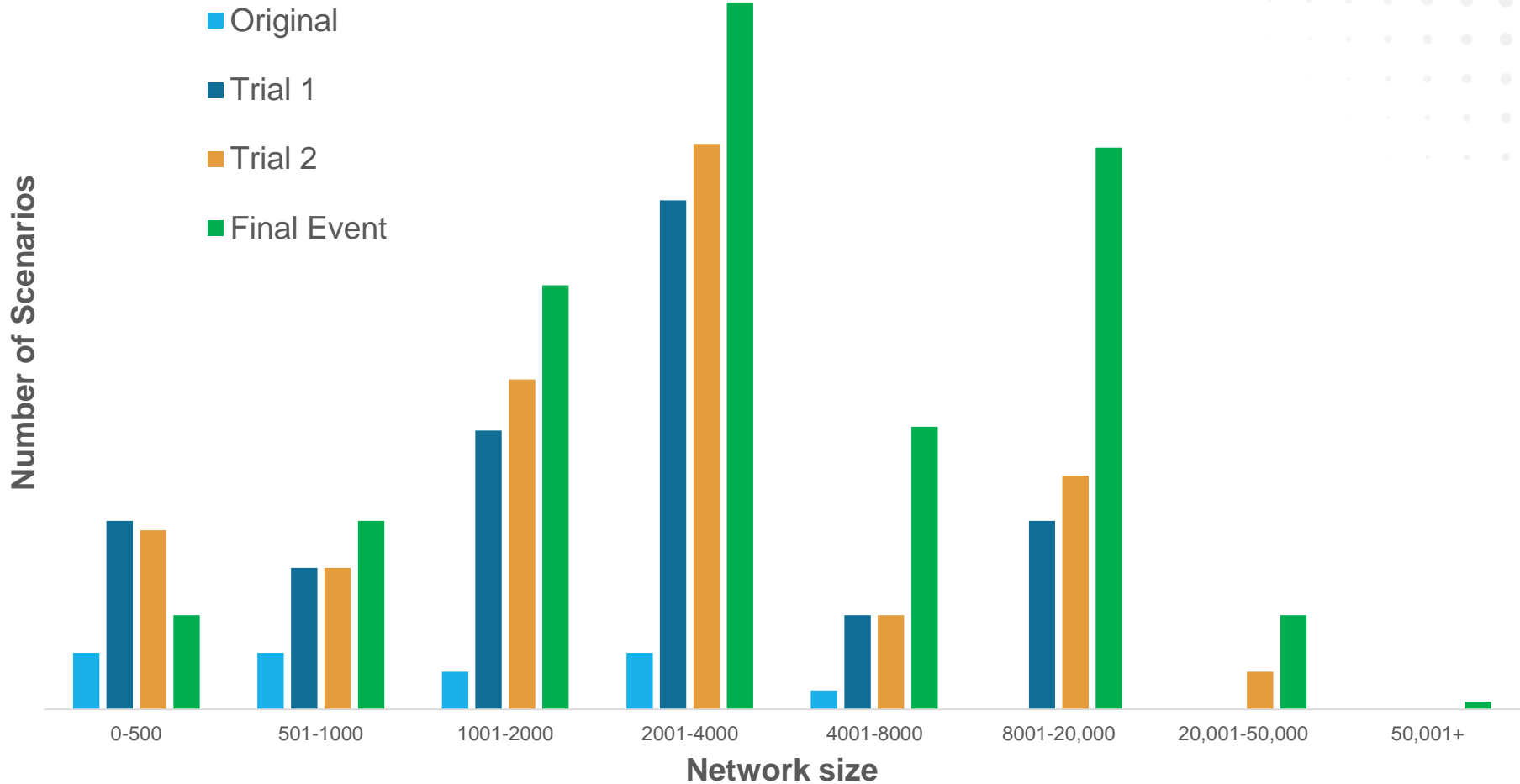
- ▶ MATLAB
- ▶ PowerWorld
- ▶ PSSE

See website for current versions and restrictions

Competition Timeline



Building complexity throughout the competition



Winning, Scoring, Divisions

Challenge 1

	Lowest Cost	Performance Profiles
Real-Time (10 Min)	Division 1 Top 10: \$100k	Division 3 Top 10: \$100k
Offline (45 Min)	Division 2 Top 10: \$100k	Division 4 Top 10: \$100k

Upcoming Dates

Webinar 2 -- Platform interaction and entry submission: February 20, 2019

Webinar 3 -- File formatting and solution evaluation: February 21, 2019

Trial 1 registration deadline: April 1, 2019

Trial 1 submission window: April 1 – April 15, 2019

Trial 1 results posted: May 1, 2019

<https://gocompetition.energy.gov/>



The screenshot shows a web browser window displaying the Grid Optimization Competition website. The browser's address bar shows the URL <https://gocompetition.energy.gov/>. The website's header includes the logo for the Advanced Research Projects Agency-Energy (arpa-e) Grid Optimization (GO) Competition, along with navigation links for Home, Competition, Forum, and FAQs, and a Log in button. The main content area features a large banner image of power lines and towers against a green and blue background with a network overlay. Below the banner, the title "Grid Optimization Competition" is displayed in a large, white font. The text below the title describes the competition's goal: to accelerate the development and comprehensive evaluation of new solution methods for grid optimization problems, including Preventative Security Constrained AC Optimal Power Flow (PSCOPF). It also mentions that algorithms that perform well will enable increased grid flexibility, reliability, and safety, while also significantly increasing economic and energy security, energy efficiency, and substantially reducing the costs of integrating variable renewable generation technologies into the electric power system in the United States. A note states that the competition will provide fair and transparent comparisons of industrially-relevant algorithm performance on high-fidelity, open-access, large-scale power system models, and a platform for the identification of transformational and disruptive methods for solving power system optimization problems. A footnote indicates that the competition is subject to appropriation of funding. A blue button labeled "LEARN MORE" is located at the bottom of the main content area.

Future Challenges

- Challenge 2:
 - Extension of Challenge 1
 - Anticipated Nov. 2019 - Nov. 2020
- Challenge 3: Stochastic Unit Commitment
- Challenges 4 and beyond
 - Advances made possible by PMU data
 - Cyber-threats
 - Stability/Dynamics

Questions?

Good luck to all entrants!



For any further questions or comments, please contact us:

GO Competition Administration Team

Website: <https://gocompetition.energy.gov>

E-mail: arpacomp@pnnl.gov

Stay Informed!

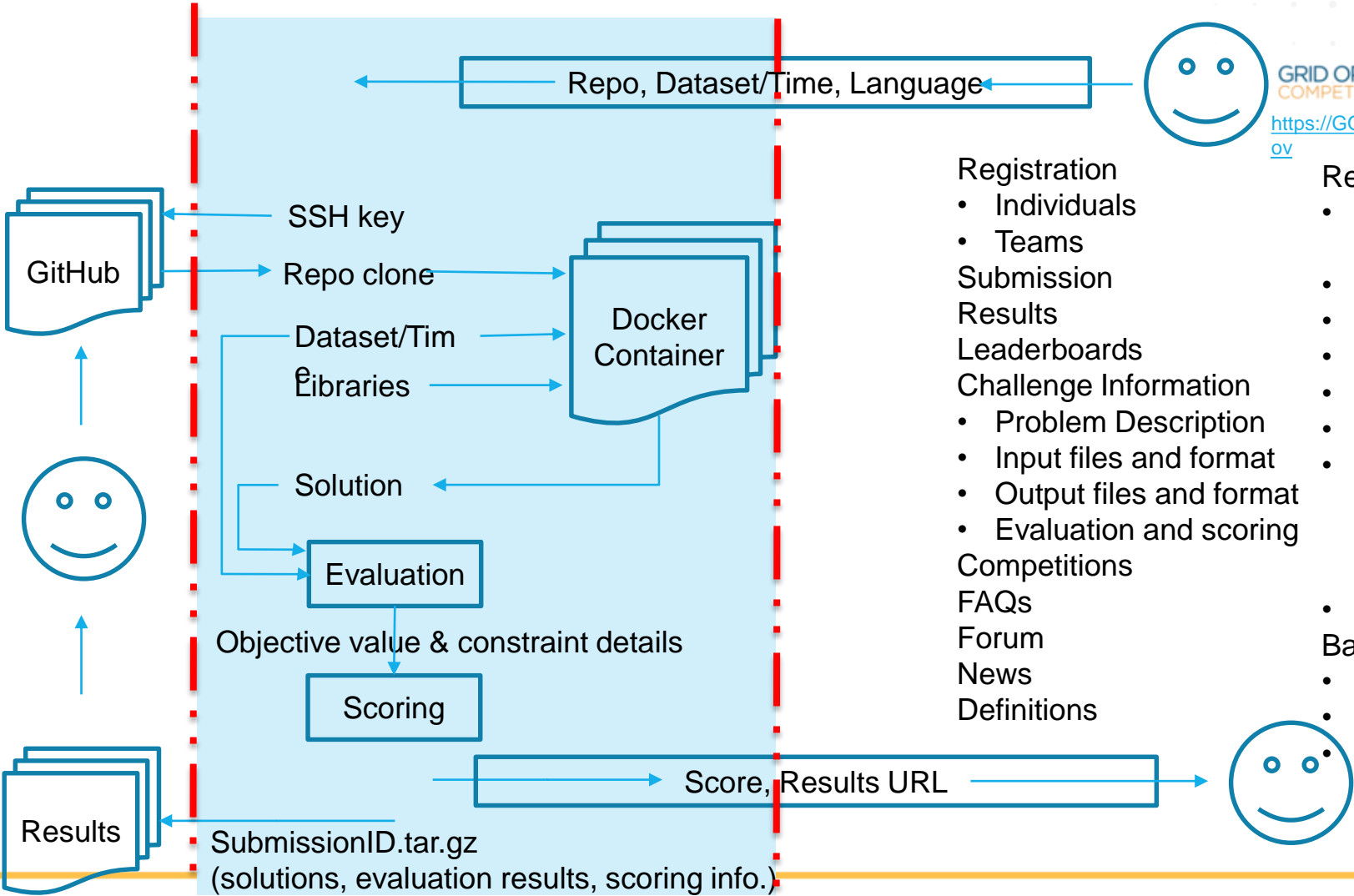
- ▶ Keep informed of the latest competition information
 - As Challenge 1 approaches, the website will be frequently updated with new information
- ▶ Forums are available on the GO Competition Web Portal
 - ARPA-E announcements
 - Community communication
 - Challenge discussions
 - Submission process
 - Performance issues
 - Scoring discussions
 - Website issues
- ▶ Contact us via the GO Competition Web Portal

The screenshot shows two sections of the website. The top section is titled "FORUMS" and has four tabs: "View Forums", "Active topics", "Unanswered topics", and "New & updated topics". Below the tabs is a table with the following data:

Forum	Topics	Posts	Last post
ARPA-E Announcements	0	0	n/a
OPF Community Central	0	0	n/a
General Discussion			

The bottom section is titled "CONTACT US" and contains three input fields: "Subject *", "E-mail Address *", and "Message *". A "Submit" button is located at the bottom of the form.

Competition Platform Components



- 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
 - Docker
 - How to register; create a team; submit
 - Rules
 - Background
 - Inspiration
 - Timeline
 - Prizes