The ICPC Resolver

An ICPC Tool

Introduction

The *ICPC Resolver* is a tool for graphical animation of contest results. It shows the final runs submitted during a contest in an interesting way, and leads up to display of the award winners. The Resolver concept was created by Fredrik Niemelä and Mattias de Zalenski at KTH - Royal Institute of Technology. The ICPC Tools Resolver implementation was developed by Tim deBoer.

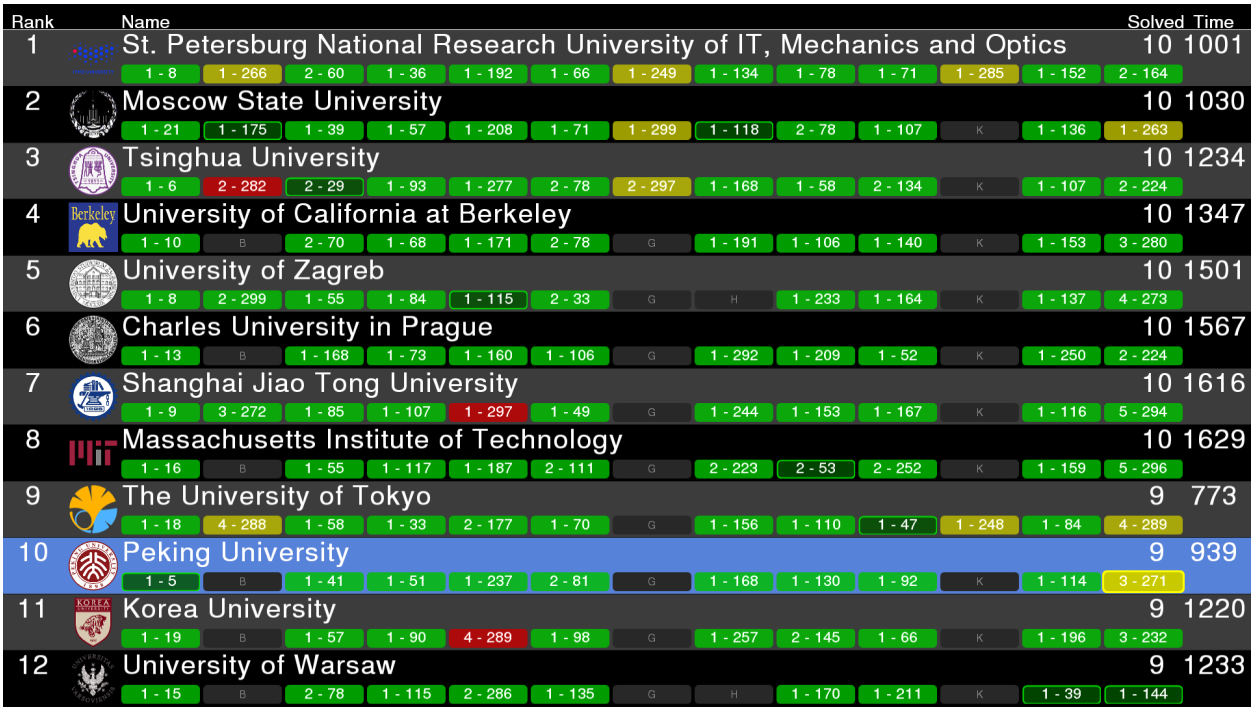
The Resolver is designed to be used in contests where the scoreboard is "frozen" prior to the end of the contest - that is, where the result of runs submitted in the last part of the contest are not displayed on the scoreboard (such runs are typically marked as "pending"). The Resolver produces a dynamic display by stepping through ("resolving") pending runs and generating displays showing the contest winners in ranked order, along with citations for awards earned.

After displaying an introductory "splash screen", a single keystroke or mouse click causes the Resolver to display the contest standings as of the time the scoreboard was frozen. A key or mouse click then causes it to advance to the bottom of the standings; a subsequent key/click starts the "resolving" process: starting at the bottom, it moves up until it reaches a team that has one or more pending submissions during the freeze time. Each pending run is 'resolved' (to either a "yes" or "no" judgment), and if the run was successful the team will move 'up' into their new position based on the results.

Options allow you to configure when the resolver pauses, but by default it will continue moving up and resolving until it gets to an 'interesting' case - typically a first-to-solve award, a "group" or "region" winner, or a gold/silver/bronze award winner. When it reaches an award, the resolver will pause and switch to a screen showing the team name, the logo and image (if available from a CDS; see below), and an award citation. Once the award has been handed out, clicking returns to the regular Resolver screen and continues the resolving process.

A variety of options are available, including managing the speed at which the Resolver runs, controlling various "single-step" operations, configuring categories of awards to be acknowledged during the resolving process, and controlling simultaneous Resolver operations at multiple contest sites.

The following shows a screen-shot of the Resolver in action. Pending (unresolved) runs are shown in yellow; the team whose pending run is about to be "resolved" is highlighted. If it is a "Yes" then the team's entire row will move dynamically up the screen to their new position.



Operational Modes

The Resolver runs in one of two basic modes: *standalone* or *distributed*. In standalone mode, the Resolver is run on a single machine and displays its output on that machine's display screen. Typically a projector is connected to the graphics output port of the machine, allowing the audience to see the Resolver display as it reveals the results of the contest. The person running the standalone Resolver uses keyboard/mouse input to control the flow of the Resolver (for example, to advance to the "next run to be resolved" or to display "award results"). Standalone mode is typically used for example to display the results at the end of a contest held at a single site.

In distributed mode, the Resolver is run on several machines. One machine (the *presenter* client) acts as the controller for the flow of events (the Contest Administrator uses keyboard/mouse input to control Resolver operation, similar to stand-alone mode). A second machine runs a CDS server; and one or more additional machines act as *viewer* clients. The server is started first and listens for connections from clients; presenter and viewer clients connect to the server over HTTPS.

Distributed mode is typically used in contests where teams are competing at different (physically remote) sites, or where the Contest Administrator wishes to see a different view of the resolving process than what is displayed to local and/or remote audiences. In distributed mode the Contest Administrator runs a presenter client and controls the flow of the Resolver, while one or more viewer clients show the current Resolver status screen. The presenter client has the option of displaying additional useful information to the person controlling the Resolver (for example, when a pending run is selected it can show a small dialog saying something like "if the team solves this run then they will jump up into 3rd place"). This extra information display is only visible on the presenter client; the viewer clients see only the main Resolver output.

Based on the access roles provided by the CDS and Contest API, the resolver requires the presenter client to have the admin role and each of the clients to have the blue access role. All of the clients work by downloading the final contest results, internally 'rewinding' to the contest freeze, and then determining the sequence of steps to get from the freeze to the final contest. The presenter client then sends out a step count to drive

the UI of all clients. Due to the requirement of blue access privileges it is expected that the resolver client credentials are only given to trusted contest staff or not distributed until the last minute.

Input Data Sources

The Resolver works with any CCS or the CDS that produces an event feed which is compliant with the Contest API Specification. Tools known to produce compliant event feeds include Contest Data Server, DOMjudge, PC-Squared, and Kattis; other Contest Control Systems may also produce compatible event feeds and hence work with the Resolver.

The Resolver can work with contest data from one of three different sources: a *Contest Package* folder, a *Contest API* source, or an *event feed* file.

If the Resolver is started with the first argument being a path (relative or absolute) to a folder, it will expect the folder to contain contest data as per the Contest Package specification. If the Resolver is started with the first argument pointing to a file, it will expect the file to be an event feed JSON file.

Alternatively the Resolver can obtain contest data from a Contest API server - for example the Contest Data Server (CDS). The Contest API provides URL access points for obtaining event feed and other contest data; and starting the Resolver with the URL of a Contest API causes it to connect to the Contest API and pull information dynamically.

The main reason for using a Contest Package or Contest API instead of a simple event feed file to provide Resolver input is that these sources can provide additional information to the Resolver, including logos or team photos. The sample image (above) shows the use of such logos.

Note: The Resolver expects the contest to be "*finalized*". "Finalizing" is an operation performed in the CCS which indicates that the contest has ended and contains the complete and final results.

Using the Resolver

Installation To install the Resolver, download its distribution package from the ICPCTools website and unzip it to any convenient location. The Resolver itself is a collection of Java programs (components). The distribution is a self-contained package which contains all the Java libraries and other components necessary to run the Resolver. (Note however, that Java version 17 or higher must be installed on the machine.)

Operation The Resolver distribution includes a set of scripts which can be used to launch the program, resolver.bat for Windows platforms and resolver.sh for macOS and Linux. (for Linux or similar systems see *Additional Notes*, below) The *resolver* script assumes it is being run from the main Resolver folder (i.e., from the folder where the distribution was unzipped). The script is intended to be invoked with a set of command line parameters, which it forwards to the actual Resolver program and which in turn control the operation of the Resolver.

The first parameter is a contest source. It may be a contest package folder, a URL to a Contest API server, or an event feed file. If the parameter is a contest URL, then the following two parameters may optionally (and should) be a user and password.

Command line parameters other than the contest source must start with the characters "--" (two dashes). Each of the available command line parameters is described below. Some command line parameters require or allow additional arguments; optional arguments are shown in square brackets ([ ]).

Note that some command line parameters are mutually exclusive.

Command Line Options

Distributed Mode Commands The following command line options are used to operate the Resolver in "distributed mode", where it connects to a Contest Data Server (see above) to obtain its input data and also uses the CDS to control multiple clients.

When running the resolver connecting to a CDS, you must connect one client with an admin account type. This client is the presenter and runs identically to standalone mode.

You may also connect any number of clients with staff account types. These clients act as viewers - they update when the presenter changes and cannot be controlled locally.

You cannot connect clients with any other account type, since they do not have access to submission results during the contest freeze.

Command line options that affect resolving (e.g. singleStep or judgeQueue) must be the same on all clients. Options that affect the display may be different (e.g. presenter may show more info than shown to an audience, each client could use a different monitor, etc).

Note that these options are only available though the Contest Data Server and not when using a generic Contest API Server.

Control Commands The following command line options control various aspects of the Resolver's operation; they may be used in either "stand-alone" or "distributed" mode. Note however that when running in distributed mode most options only make sense for a presenter (for example, only the presenter should specify *--speed* to control the speed of the Resolver; otherwise viewer clients will operate at a different speed than that of the presenter).

`--info`

Shows additional information regarding each pending run.

`--speed <speedFactor>`

Changes the resolving speed. The [speedFactor] option is a decimal percentage indicating the desired amount of change in the execution time for each step. Factors between 0 and 1 slow down the resolving process; factors greater than 1 speed it up. For example a speedFactor of 2 will resolve twice as fast.

`--singleStep <startRow>`

Forces the Resolver to begin "single-stepping" (that is, requiring a key/mouse click to advance on each step of the resolving process) starting at the specified row in the standings. (For example, specifying a startRow of 10 causes single-stepping for the top 10 places in the contest.) If [startRow] is omitted then the Resolver single-steps through the entire contest.

`--rowDisplayOffset <numRows>`

Normally, medalist display rows on the Resolver screen appear at the bottom of the screen. This option allows forcing the medalist display rows to begin appearing higher on the screen by some number of rows. It is used for example in the ICPC World Finals when Medalists come on stage to receive their award and remain there for the rest of the Award Ceremony; the people standing on stage can block the audience view of the bottom of the screen (and hence the next teams being processed by the Resolver). Specifying this option allows moving the medalist display rows up the screen above the heads of the people standing on stage. The default value for [numRows] if it is not specified on the command option is 4.

`--file <file>`

Allows loading command options from the specified instead of passing them on the command line. When using this option, every command option and every optional parameter must appear on a separate line in the file.

`--display <num>`

Specifies which desktop display to use in full-screen exclusive mode. The primary display is number 1, secondary is number 2, etc. If this option is not specified the default is the primary display.

`--display_name <template>`

Allows you to change the way team names are displayed using a template with the following parameters:

Parameter	Value
{team.display_name}	The team's display name, e.g. "drop tables". If there is no display name the team name will be use
{team.name}	The team's name, e.g. "drop tables".
{org.name}	The organizations name, often a short form, e.g. "UBC".
{org.formal_name}	The full organization name, e.g. "University of Toronto". If there is no formal name the organizatio

Examples:

- -—display_name "{team.name} ({org.name})"
- -—display_name "{org.formal_name}"
- -—display_name "{org.formal_name} ({team.name})"

`--test`

Allows the resolver to be run against an incomplete contest. Unjudged submissions are automatically discarded before resolving.

`--pause <#>`

Starts the resolver at the specified "pause" (i.e. click). Useful for testing or jumping to review the medalists without restarting from the beginning.

`--light`

Light mode - use a white background and shift colors to match.

`--help`

Displays a help message listing the available options

Keyboard Shortcuts Once the resolver is running, there are a number of commands that can be used to change behavior.

`Ctrl-Q`

Quit/exit the resolver (Ctrl-*Escape* also exits).

`space or f`

Go forward one resolution step.

`r or b`

Rewind (back up) one resolution step.

`0`

Restart (jump to beginning).

`2`

Fast forward (jump one step without delays).

`1`

Fast rewind (jump one step without delays).

`+ (or =)`

Changes the resolving speed by increasing resolution delay (speedFactor).

`- (or _)`

Changes the resolving speed by decreasing resolution delay (speedFactor).

`i`

Toggle additional information regarding each pending run (same as --info).

Command Line Examples

```
resolver.bat https://169.254.80.194:8443 admin adm1n --speed 1.3
  --rowDisplayOffset 4 --info
```

The above command runs the Resolver in presenter mode, connected to a CDS at the specified URL (IP address and port) using the specified server login and password credentials, and runs 30% faster (--speed 1.3). Additional "presenter info" is displayed on the screen.

```
resolver.bat https://169.254.80.194:8443 client cl1ent
```

The above command runs the Resolver in "client" mode, connecting to a CDS at the specified URL using the specified server login and password credentials. The client resolver operates under the control of a presenter-mode resolver at the same speed as the presenter and displaying only the Resolver data (no special info).

```
resolver.bat c:\events.json --singleStep 999
```

The above command runs the Resolver in "stand-alone" mode, taking its input from the specified local file. It runs in single-step mode for the entire resolving process (meaning the user must click to advance each and every step of the resolving process).

```
resolver.bat c:\contests\pacnw
```

The above command runs the Resolver in "stand-alone" mode, taking its input from the specified contest package folder. It includes whatever additional data it can find (for example, team pictures and/or logos) in the output displays.

```
resolver.bat --help
```

The above command causes the Resolver to display its command parameter options on the console.

Awards

In addition to stepping bottom-up through the contest scoreboard resolving pending runs and dynamically adjusting teams' positions on the scoreboard, the Resolver can be configured to display various types of *awards*. When a team's final position in the contest has been determined (meaning, the team has no more pending runs and has risen as far in the rankings as they can go), then if the team is eligible for one or more enabled awards then on the next key/mouse 'click' the Resolver will pause and switch to an "Award Screen". The contents of the Award Screen depend on both the current Resolver award configuration and on the data available to the Resolver (for example, whether it is connected to a CDS providing additional data such as team pictures).

Note that awards are not displayed until a team has reached its final (highest possible) position. The Resolver keeps track of all the awards a team earns and then when the team reaches their final position in the standings, then if it has been configured to display at least one of the awards earned by that team then it switches to a separate "Award screen" showing the team and listing *all* of the configured awards earned by the team.

Default Award Configuration By default the Resolver is configured to display awards the way they are specified for the ICPC World Finals. This section describes the World Finals awards, in order to clarify the default Resolver award configuration. (See the following section for information on how to *change* the Resolver's default award configuration if your contest awards do not match those of the default configuration.)

At the World Finals, the top 12 teams receive "medal awards":
the top four teams receive Gold Medals, the next four teams receive Silver Medals, and the next group of teams receive Bronze Medals (typically the size of the Bronze Medal cohort is also four, but this can vary

depending on the final outcome; sometimes the Judges elect to award additional Bronze Medals to teams beyond the top 12). By default the Resolver is configured to display these same medal awards.

In addition, awards are presented at the World Finals to the highest placing team in each region of the world. Note: while the term "region" makes sense when considering geographic boundaries such as those in the ICPC World Finals, in many contests teams are grouped by different categories such as academic level (e.g. "High School", "Undergraduate", "Graduate", etc.) Because of this, many of the ICPC Tools (including the Resolver and the Award Generator -- see below) use the term "group" interchangeably with the term "region" to refer to a unique subset of the teams competing in a given contest.

The specification of what groups exist in a contest comes from the event feed (so, ultimately it comes from the CCS which generated the event feed). The CCS used in the World Finals is configured to define six "regions" (groups): North America, Latin American (comprising Central and South America), Europe, Asia, Africa and the Middle East, and the South Pacific.
(See the interactive ICPC Regional Finder map for definitions of the precise boundaries of ICPC Regions.) The highest placing team at the World Finals from each of the six ICPC regions receives an award acknowledging their accomplishment as "Regional Champion". The Resolver by default displays an award for the top team in each group defined in its event feed.

Awards are also presented at the World Finals to each team that is the first to solve each problem in the contest. These "First-to-Solve (FTS)" awards occur in two categories: those for solutions which came prior to the time the scoreboard was frozen (and hence are by definition already known to the spectators prior to the time the Resolver begins), and those which occurred after the scoreboard was frozen (and hence are not known by spectators until the Resolver reaches the pending run for that solution). At the World Finals, the FTS awards for solutions which occurred prior to the scoreboard freeze are handed out separately prior to beginning the Resolver execution; only FTS awards for problems solved after the scoreboard freeze are treated as awards during the execution of the Resolver.

Taken together, the above means that by default the Resolver will automatically pause and then switch to an Award screen when a team reaches their highest final position in the contest if the team has earned any Medal (of which there are four Gold, four Silver, and four or more Bronze), if the team is the top team in their region/group (based on whatever groups are defined in the event feed), and/or if the team has earned a First-to-Solve award (if the FTS occurred after the scoreboard was frozen). All of the awards which the team has earned will be listed on the Award screen, along with the team's name, school, and picture if that data has been made available by connecting the Resolver to a CDS.

Custom Award Configuration The award structure of a given contest may be different than the default arrangement described above. In order to support this, the Resolver allows *customizable* award categories. Customizing the award categories requires executing an *award pre-processor* step prior to running the Resolver. The award preprocessor (also called the *Award Generator (AG)*) reads the event feed which was going to be input to the Resolver and produces a new *augmented event feed* containing additional award configuration information. When the Resolver is executed using an augmented event feed it recognizes the additional award configuration information and uses it to control its behavior with regard to displaying awards.

The AG is invoked by executing a script, either *awards.bat* on a Windows machine or *awards.sh* on a Linux or macOS machine. The script is located in the root folder of the unzipped Resolver distribution, in the same place as the *resolver.bat* script used to start the Resolver itself. Specification of the custom award configuration can be done in one of two ways: by passing command line options to the *awards* script, or by invoking a separate graphical user interface (GUI) that allows interactive award configuration.

Command Line Award Configuration The *awards* script (this refers to both the Windows ".bat" version and the Bourne Shell ".sh" version) accepts a variety of arguments and options for generating an augmented event feed used to control the awards to be displayed by the Resolver. The general form of the command to invoke the awards script is

```
awards
```

or

```
awards events.json options...
```

Omitting all arguments (as shown in the first example) causes the script to invoke the interactive Award Generator interface (see below).

If arguments are specified, then the first argument must be the name of a file containing an event feed. The AG reads the specified event feed file and generates a new augmented event feed file containing awards as specified by the remaining "option" arguments. Failing to specify any options (that is, specifying just an event feed file name) is an error and causes the AG to generate a help (usage) message and quit.

When using the command line award configuration method, the augmented event feed file is automatically saved in a new file whose name is the same as the specified *events.json* file but with "-awards" added in front of the ".json" extension. (That is, the AG strips off the last five characters of the specified file name, assumed to be ".json", and replaces them with the characters "-awards.json".)

Command Line Options

The following options can be added to the *awards* script command line following the event feed file name. Note that all options start with the characters "--" (two hyphens), and that at least one option (with its arguments) must be specified.

```
--medals <lastGold> <lastSilver> <lastBronze>
```

The above option specifies the last integer rank (position) in the contest which will be awarded Gold, Silver, and Bronze medals respectively. For example, the option "--medals 2 4 7" indicates that First and Second places will receive Gold medals, Third and Fourth places will receive Silver medals, and Fifth through Seventh places will receive Bronze medals.

Note that a "finalized" event feed from a CCS by default contains "medalist places" as defined by the CCS which generated the event feed. However, running the AG on such an event feed *overrides* those medal places, replacing them with whatever medals are specified via a *--medals* option. In particular, note that this means that running the AG without specifying *any --medals* option results in an output event feed with NO medals awarded.

```
--rank <number>
```

The above option indicates that awards should be generated for teams in the top ranks (positions) in the contest. For example, "--rank 10" will cause the top 10 teams to be designated to receive a "rank award".

```
--group <num>
```

The above option indicates that awards should be generated for the top number of teams in each group in the contest (where "groups" are defined in the input event feed file as configured in the CCS which generated the file). In the current version of the command line AG tool it is only possible to specify Group awards for the *top* team in each group (which is what specifying the "--group" option does). For information on changing the number of awards *within* a group, see the interactive award configuration tool, described below.

```
--firstPlaceCitation "text"
```

The above option specifies the "citation text" which appears on the Award screen for the 1st place team, replacing the default first-place citation (which is "World Champions") with the specified text. If the citation text contains spaces then it must be surrounded with double-quotes. In the current version of the command line AG tool it is only possible to change the citation for the 1st place team (see the interactive award configuration tool, described below).

```
--fts  beforeFreezeBoolean afterFreezeBoolean
```

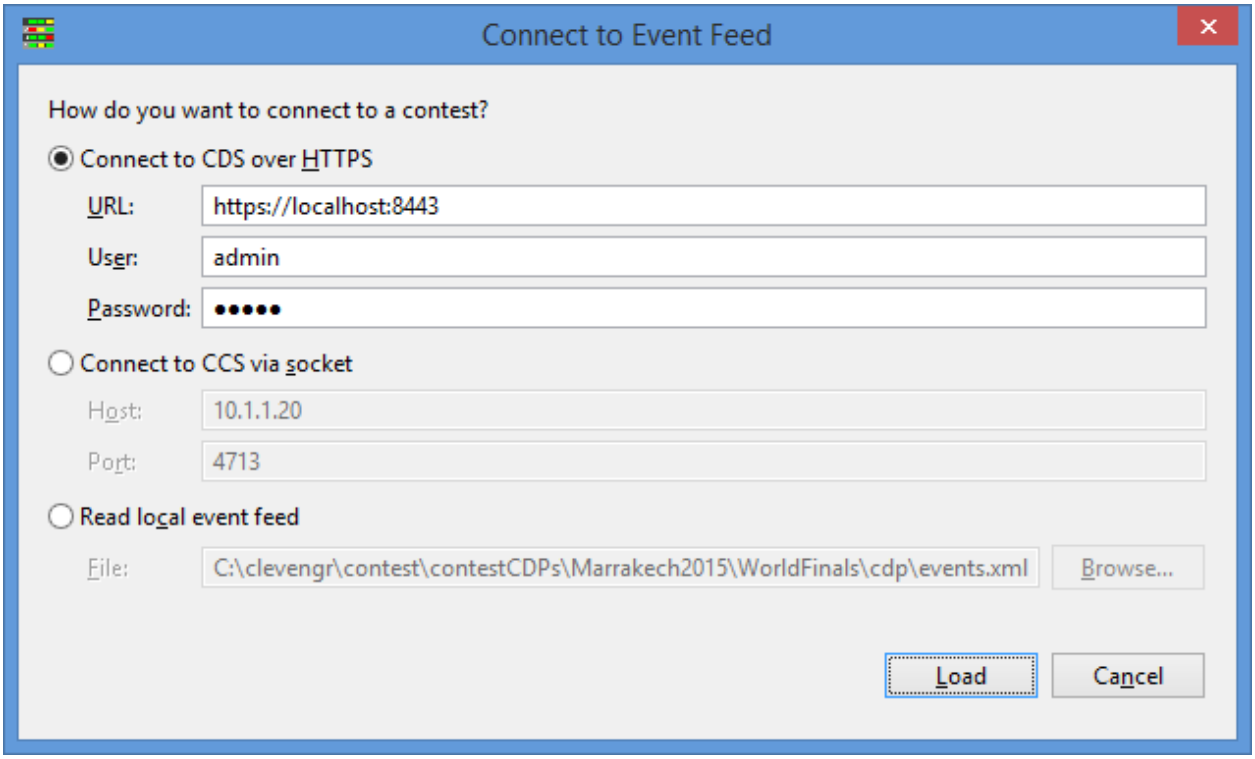
The above option indicates whether First-to-Solve awards should be generated for solutions which came before and after the scoreboard was frozen. To specify that an award category should be generated, enter the

word "true" in place of either *beforeFreezeBoolean* or *afterFreezeBoolean*; to specify that the corresponding award should NOT be generated, enter the word "false". The words "true" and "false" are not case-sensitive.

`--scoreboard filename`

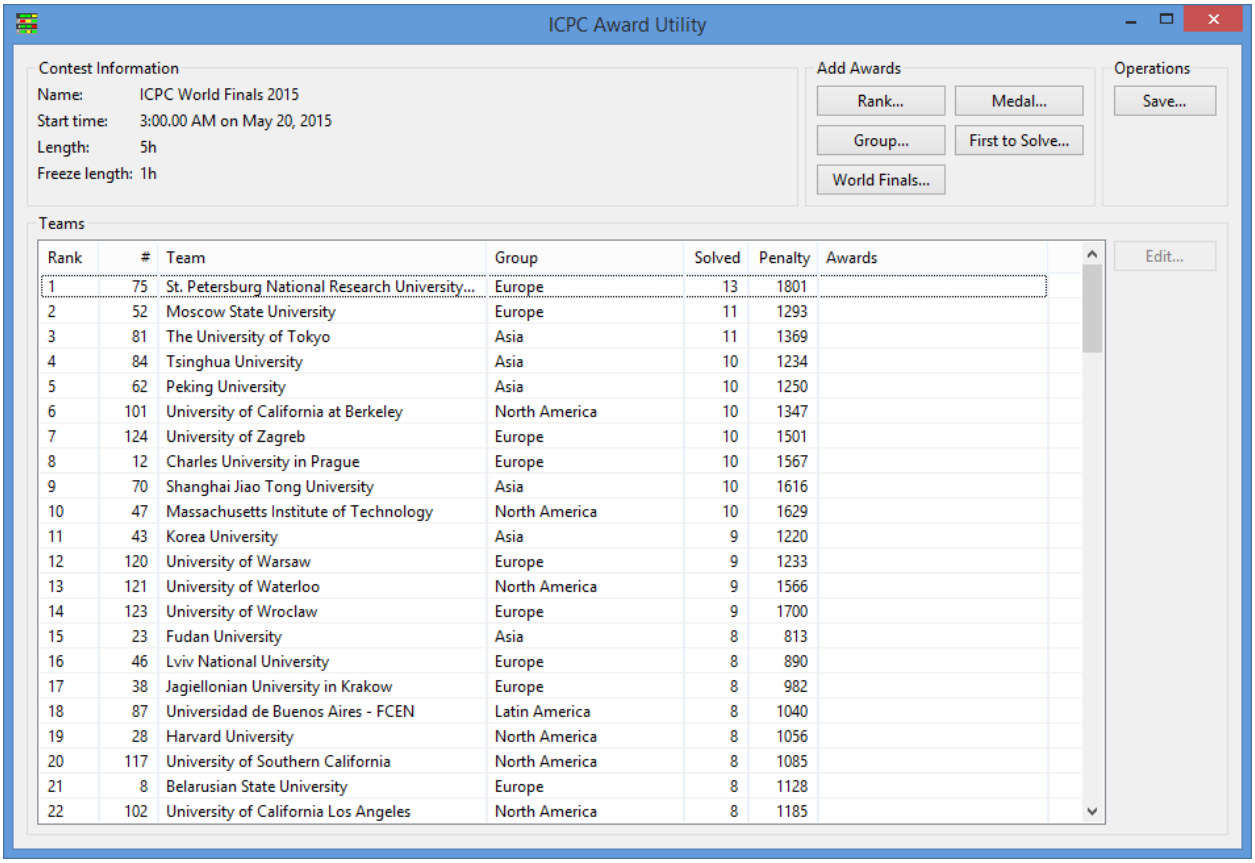
Generates a JSON scoreboard to the named file.

Interactive Award Configuration If the *awards* script is invoked with *no* parameters, it causes the following dialog to be displayed:



This screen is used to select where to load the contest to generate awards. The interactive Award Generator is capable of operating with data obtained from one of three different sources: a Contest Package, a Contest API, or an event feed file.

Selecting the desired option and pressing the "Load" button will load the data into the AG and then display the Award Generator main screen, as shown below:



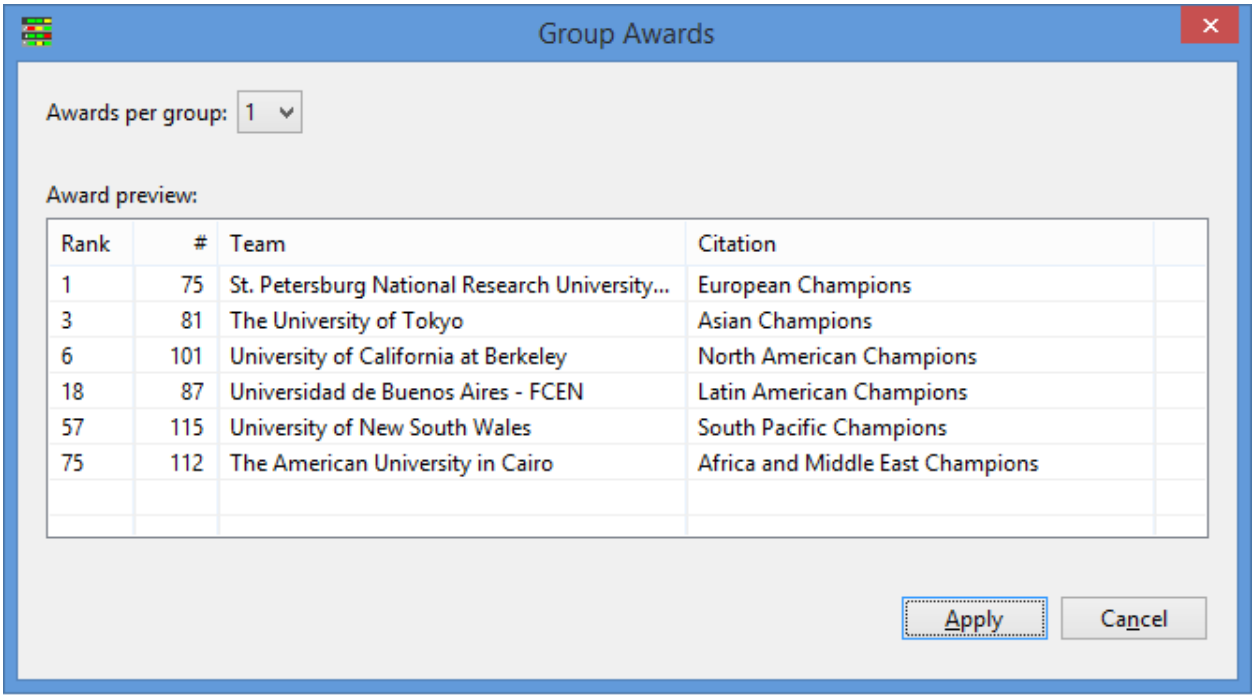
Rank	#	Team	Group	Solved	Penalty	Awards
1	75	St. Petersburg National Research University...	Europe	13	1801	
2	52	Moscow State University	Europe	11	1293	
3	81	The University of Tokyo	Asia	11	1369	
4	84	Tsinghua University	Asia	10	1234	
5	62	Peking University	Asia	10	1250	
6	101	University of California at Berkeley	North America	10	1347	
7	124	University of Zagreb	Europe	10	1501	
8	12	Charles University in Prague	Europe	10	1567	
9	70	Shanghai Jiao Tong University	Asia	10	1616	
10	47	Massachusetts Institute of Technology	North America	10	1629	
11	43	Korea University	Asia	9	1220	
12	120	University of Warsaw	Europe	9	1233	
13	121	University of Waterloo	North America	9	1566	
14	123	University of Wroclaw	Europe	9	1700	
15	23	Fudan University	Asia	8	813	
16	46	Lviv National University	Europe	8	890	
17	38	Jagiellonian University in Krakow	Europe	8	982	
18	87	Universidad de Buenos Aires - FCEN	Latin America	8	1040	
19	28	Harvard University	North America	8	1056	
20	117	University of Southern California	North America	8	1085	
21	8	Belarusian State University	Europe	8	1128	
22	102	University of California Los Angeles	North America	8	1185	

In the above screen the Award Generator has been loaded with the finalized data from the 2015 ICPC World Finals. The grid shows each team's final rank, team number, team name, group (ICPC "Region"), the number of problems solved, and the total "penalty points" (time). Note that the "Awards" column is empty; the Award Generator starts off with no Awards configured.

The buttons in the *Add Awards* panel (upper right) are used to specify how awards are to be configured for different categories in the contest. Examples of configuring different categories are described below.

Group Awards

Pressing the *Group...* button pops up the following dialog for managing Group awards:



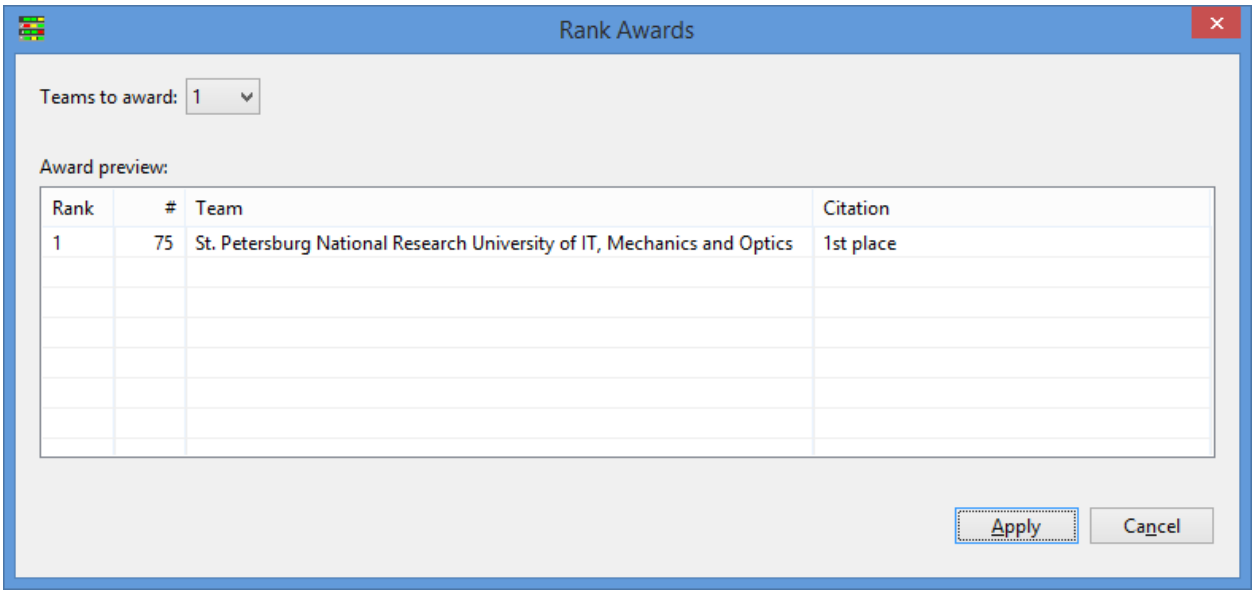
By default there is just one award per group (for example, there is a single "Regional Champion" in ICPC World Finals terminology); this is shown in the above image where there is one "award winner" in each of the (six) Regions (groups) defined in the contest event feed. Pressing the *Apply* button instructs the AG to use the specified Group Award configuration.

If, prior to pressing *Apply*, the *Awards per group* dropdown (shown in the upper left in the above image) is used to specify (say) two awards per group, then the top *two* teams in each group would be configured to receive a group award for their group. (The "citation" associated with groups cannot be changed on the Group Awards dialog; however, see below regarding editing team awards.)

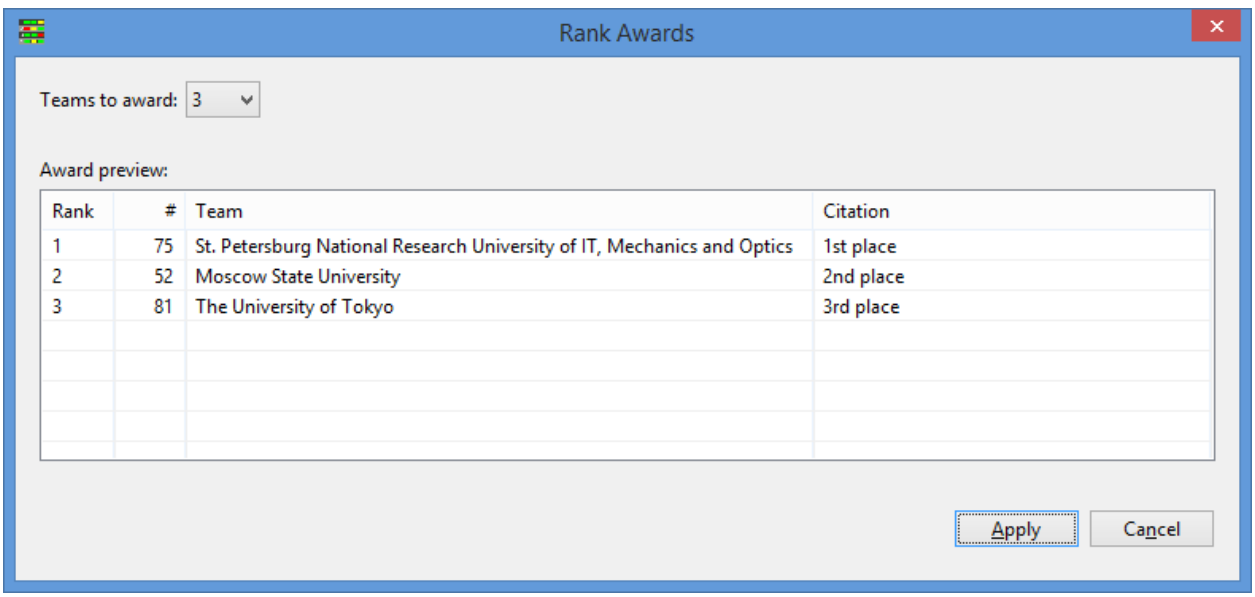
Note: the specification of what groups exist in the contest is not configurable in the Award Generator; this specification comes from the event feed generated by the CCS. If different groups are desired then they must be configured in the CCS before it creates the event feed.

Rank Awards

Pressing the *Rank...* button on the *Add Awards* panel pops up a *Rank Awards* dialog intended to configure how awards are handled for ranks (final position in the contest), as shown below:



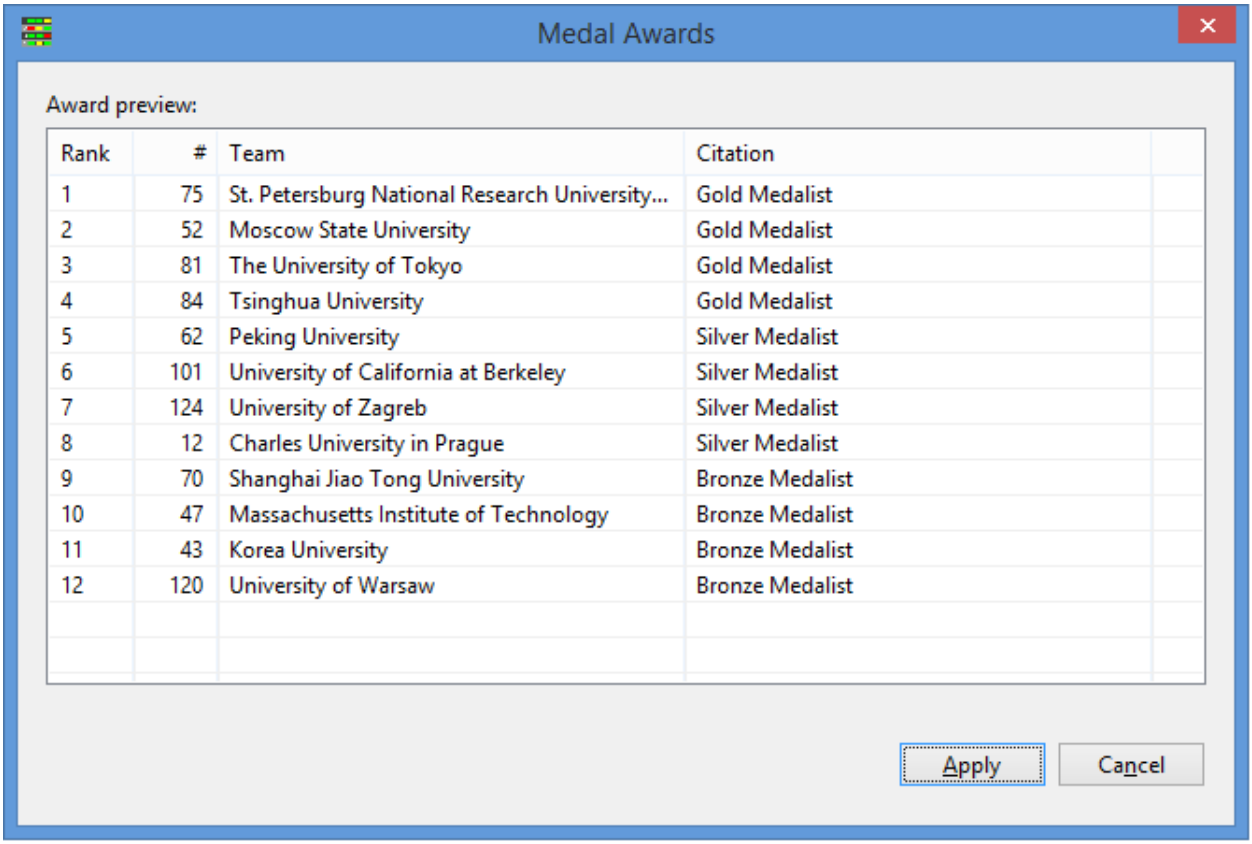
Note that by default only a single "Rank" award (1st Place) is specified. If the *Teams to award* dropdown (upper left) is used to specify (say) three teams, then the top *three* teams in the contest would be configured to receive Rank awards, as shown in the following image.



Pressing the *Apply* button on the Rank Awards dialog configures the AG to generate the specified rank awards.

Medal Awards

Pressing *Medal...* on the *Add Awards* panel pops up the following dialog for configuring Medal awards:



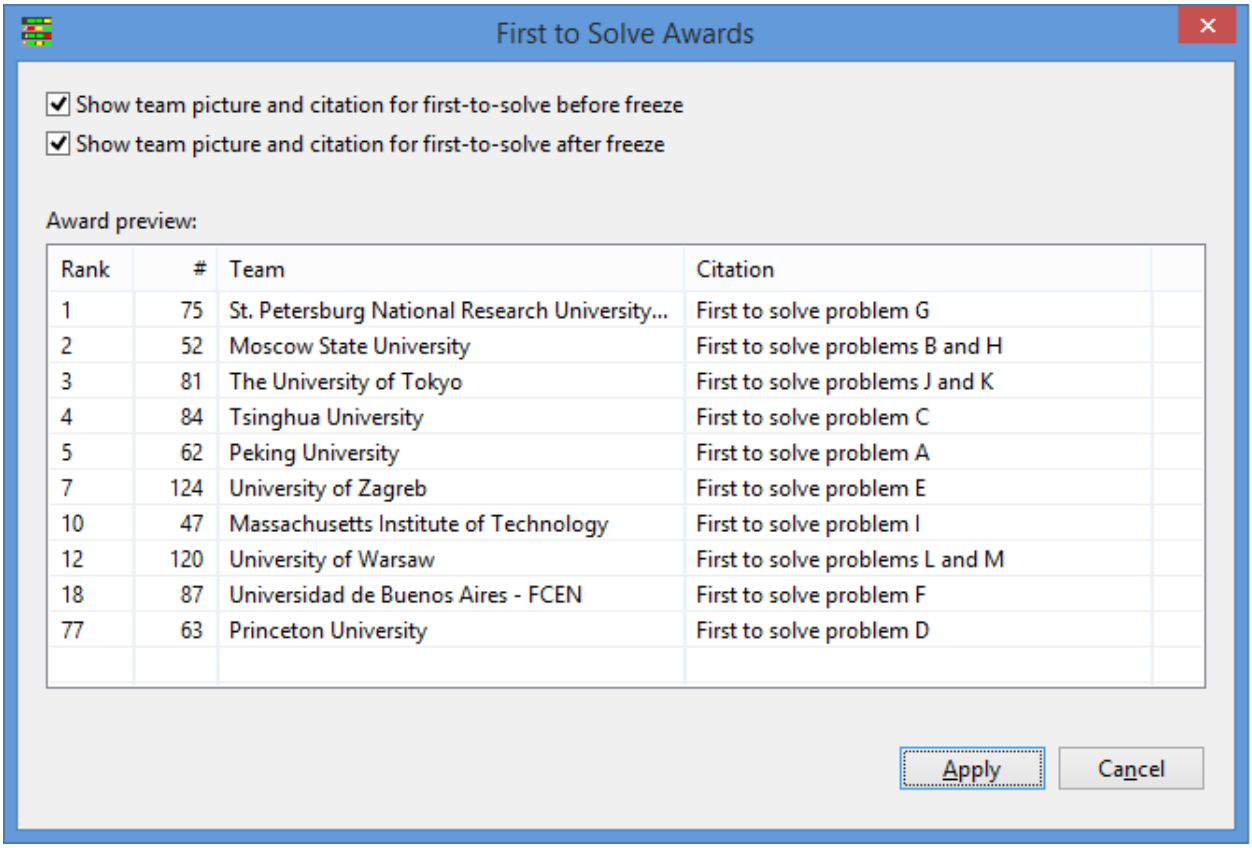
Rank	#	Team	Citation
1	75	St. Petersburg National Research University...	Gold Medalist
2	52	Moscow State University	Gold Medalist
3	81	The University of Tokyo	Gold Medalist
4	84	Tsinghua University	Gold Medalist
5	62	Peking University	Silver Medalist
6	101	University of California at Berkeley	Silver Medalist
7	124	University of Zagreb	Silver Medalist
8	12	Charles University in Prague	Silver Medalist
9	70	Shanghai Jiao Tong University	Bronze Medalist
10	47	Massachusetts Institute of Technology	Bronze Medalist
11	43	Korea University	Bronze Medalist
12	120	University of Warsaw	Bronze Medalist

As shown, the top twelve ranks in the contest are configured to receive medals: four gold, four silver, and four bronze. The medal counts came from the input event feed (meaning, they came from the CCS) and cannot be changed in the current version of the interactive AG (although they can be changed using a command line option as described earlier). A future version of the AG will support interactive modification of the medal counts.

As with the other *Add Awards* dialogs, pressing *Apply* instructs the AG to configure the specified medal awards.

First-to-Solve Awards

Pressing *First to Solve* on the *Add Awards* panel displays the following dialog for configuring FTS awards:

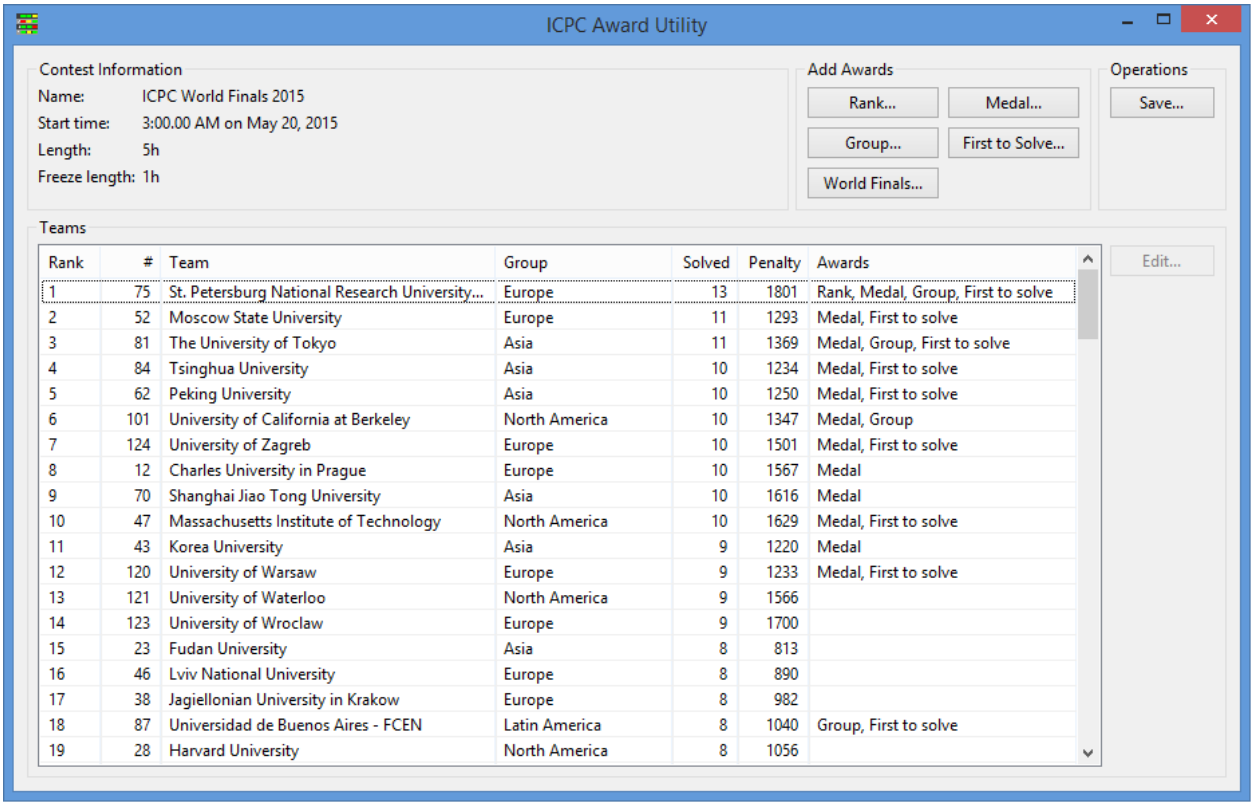


As with some of the other Award configuration dialogs, the current version of the AG does not support changing the FTS configuration. The FTS dialog does however allow using the checkboxes in the upper left to control whether or not the team's picture and the specified citation appears on configured FTS awards.

As with the other dialogs, pressing *Apply* instructs the AG to configure the specified FTS awards.

Summary

The following image shows the Award Generator main screen after Rank, Medal, Group, and FTS awards have been configured:



Rank	#	Team	Group	Solved	Penalty	Awards
1	75	St. Petersburg National Research University...	Europe	13	1801	Rank, Medal, Group, First to solve
2	52	Moscow State University	Europe	11	1293	Medal, First to solve
3	81	The University of Tokyo	Asia	11	1369	Medal, Group, First to solve
4	84	Tsinghua University	Asia	10	1234	Medal, First to solve
5	62	Peking University	Asia	10	1250	Medal, First to solve
6	101	University of California at Berkeley	North America	10	1347	Medal, Group
7	124	University of Zagreb	Europe	10	1501	Medal, First to solve
8	12	Charles University in Prague	Europe	10	1567	Medal
9	70	Shanghai Jiao Tong University	Asia	10	1616	Medal
10	47	Massachusetts Institute of Technology	North America	10	1629	Medal, First to solve
11	43	Korea University	Asia	9	1220	Medal
12	120	University of Warsaw	Europe	9	1233	Medal, First to solve
13	121	University of Waterloo	North America	9	1566	
14	123	University of Wroclaw	Europe	9	1700	
15	23	Fudan University	Asia	8	813	
16	46	Lviv National University	Europe	8	890	
17	38	Jagiellonian University in Krakow	Europe	8	982	
18	87	Universidad de Buenos Aires - FCEN	Latin America	8	1040	Group, First to solve
19	28	Harvard University	North America	8	1056	

Note that the team data (ranks, names, groups, etc.) is the same as in the first AG main screen image shown earlier, but now the "Awards" column has been filled in. The values in this column indicate what Awards will be displayed by the Resolver.

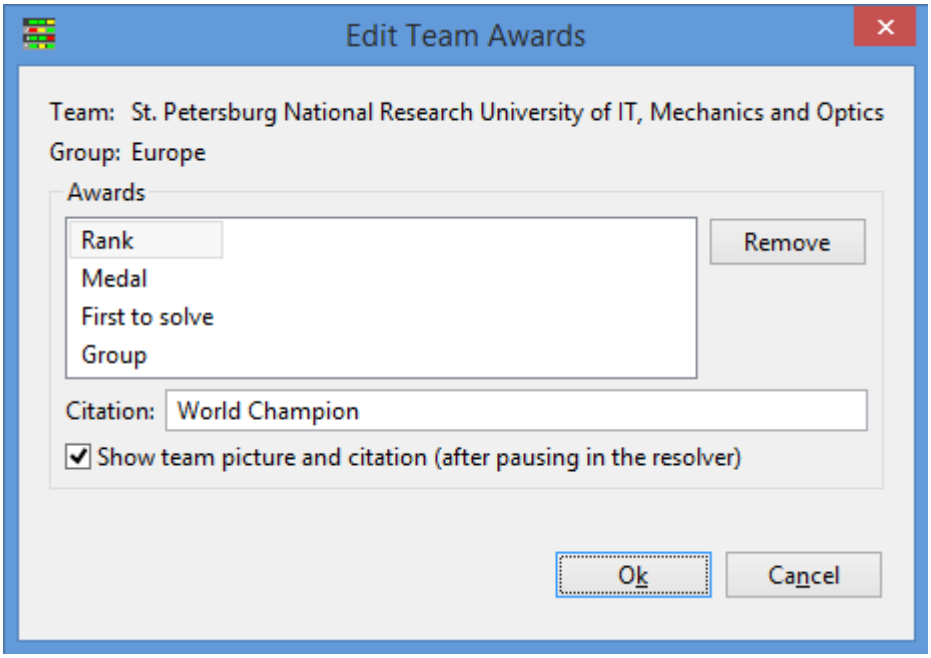
World Finals Awards

The remaining button on the *Add Awards* panel, *World Finals...*, is a convenience shortcut for configuring the AG to use the default World Finals awards. Pressing *World Finals...* displays a listing of exactly what awards would be given in the current contest if awards were configured exactly as is done in the World Finals; hitting *Apply* then applies those awards in the AG.

Note that applying the World Finals award configuration in the AG produces an augmented event feed that would be handled in exactly the same way by the Resolver as if the AG had not been used (since hitting *Apply* on the *World Finals...* panel configures awards using the same values as the default values in the Resolver). The World Finals configuration option exists as a convenience in anticipation of providing a different default award configuration in future versions of the Resolver.

Editing Awards Once the desired award categories have been configured in the AG, it is possible to modify the awards to be issued to any particular team. This is useful, for example, to circumvent the problem that if multiple Group awards are configured for each group (region), the citations for all Group awards in the group (region) will be identical (each team will be listed as "Group Champion").

To modify a team's award, select the team's row in the AG main screen grid and click the *Edit* button to the right of the grid. This produces an Edit dialog similar to the following:



This dialog displays all the awards currently configured for the selected team, along with the corresponding "citations" which will appear on their award display (one citation for each different award category). Any desired award citation can be edited by first selecting the award category (for example, Rank, Group, Medal, or First To Solve) and then typing the desired citation in the "Citation" textbox. Awards can be removed from the award display by selecting the award and pressing the "Remove" button.

The checkbox on the Edit Team Awards dialog is used to tell the Resolver whether or not it should show the team's picture and citation(s); unchecking the box will have the effect of causing the Resolver to pause upon reaching the team but NOT switch to a separate award screen on the next click. If the checkbox is *checked* (selected) then upon entering a key/mouse click after the Resolver pauses at the team the Resolver will switch to a separate Award screen listing the team's awards and corresponding citations (and showing their picture if it is available).

Once the desired team award configuration has been specified, click "OK" to save it (or click "Cancel" to leave the team's awards unchanged).

Saving the Award Configuration To save the generated Award configuration, press the *Save...* button on the *Operations* panel in the upper right. This will prompt for a file name and will save a new augmented event feed file containing the configured awards in JSON format in the specified file.

Once an augmented event feed file has been saved, it must be provided as input to the Resolver in order for the specified awards to be displayed. If the Resolver is being run with a local event feed file as input, simply specify the augmented event feed file as the local input file on the *resolver.bat* command line (see *Command Line Examples*, above).

If on the other hand the Resolver is obtaining its input from a local Contest Package or via a connection to a CDS, the augmented event feed file must be copied to the local Contest Package folder or to the Contest Package being hosted by the CDS, and then in the latter case the CDS must be restarted (see the separate documentation for the *ICPCTools CDS*, available from the ICPCTools website for further information).

Additional Notes

The Resolver and Award Generator tools will run on any platform supporting Java. However, the Resolver makes heavy use of screen-level graphics and is therefore heavily dependent on the graphics drivers on the platform. In our experience, Linux graphics drivers are substantially less robust than others; we have had

much better success running the graphical Resolver components (standalone, presenter, and viewer clients) on Windows and macOS platforms (although we regularly run the Resolver server on Linux). Your mileage may vary (substantially).