

System description

AMBICA Automatic Referee Assignment System (ARAS) is an easy way how to **assign available referees** for upcoming matches of ice hockey competitions. Our system is also capable to **inform the referees** about their delegation and can also serve for **other mutual communication** between the governing bodies at competitions, referees and clubs through an intuitive web interface application, e-mails and text messages.

Basic functions

The system allows users to easily and automatically generate referee schedules for matches within the selected competition for the selected time period.

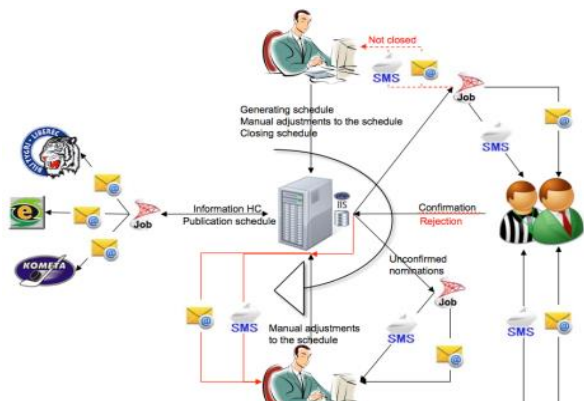


Figure: Referees assignment communication scheme

After any eventual manual correction and closure of the schedule for any specified period by the administrator of the competition, referees and delegates are informed by an email or a text message in advance. They obtain an information consisting of which match they have been delegated to, including all the necessary details. The referees must confirm their participation (or refuse with mandatory justification). The referees can see all the matches which they were delegated to within the application and they can view the perspective of the closed period (only the date when they need to book certain time).

The referees and delegates who are selected for a certain match are informed about each other under certain conditions. Club representatives are also informed certain time (the time period can be set) before the match by an e-mail and text message about referees assigned to the match.

The process of referees assignment

Referees assignment is activated manually by an authorized person. Administrator can generate the referee schedules as frequently as needed. The delegations are always generated for all matches within the specified period.

In case of manual delegation of a certain referee for a match before running the automated generation (e.g. foreign referees), his delegation is not overwritten by the automated generation. The schedules can be additionally edited even after the automated generation by an authorized person. Any changes are reported to referees automatically. All changes made and the messages sent are logged with the possibility to display them.

The Algorithm for creating the referee schedule is very flexible thanks to a number of adjustable parameters in the form of constraints or specific scales. These parameters provide a wide range of customization and fine-tuning of the algorithm according to the user needs and the specific situation.

For example, at the beginning of the season, the system can prioritize economical aspect of referees travels and during play-off, it can prioritize delegating referees preferably according to their quality.

Conditions:

- Repeating the same combination of referees - club and referees - a pair of clubs. The number of rounds in which the combination of referee - team will not be repeated is parameterized.
- The number of cars for the transportation of the referees.
- Restrictions. From the process of generating there are certain persons discarded (announced indisposition, holiday, international contract etc.).

Scales:

- Economical aspects. The travel distance is minimized. It is proposed to share a vehicle and collecting the referees on the way. If needed, two-day trip with an overnight stay is proposed.
- The referees with fewer matches are preferred.
- The referees with higher quality are preferred.
- The referees with fewer numbers of rejections are preferred.

Quantitative application of the selected conditions (criteria) obeys the specified criteria scale (distance, number of controlled matches, etc.). The scale determines greater or lesser significance of certain criterion for the selection of referees for the specific round.

Referees assignment

The figure below shows an example of the referees assignment for a selected competition and time period. The icon by each match visualizes the delegation state. Green colour means that the delegation was confirmed by the referees, red indicates the need of manual intervention by the administrator. That is usually in case of rejection by a referee, or if the referee does not respond to messages and reminders sent within the means of assignment system.

Additional features of the system

The screenshot shows the SRR (Systém pro rozlosování rozhodčích) interface. It displays a table of match delegations for the 2016-2017 season. The table includes columns for match date, time, teams, and assigned referees. The interface also shows a sidebar with navigation options and a search bar.

Datum*	K	Č	D	N	HR	HR2	ČR1	ČR2	BVR	DEL
20.05.16 20:00	35	728	750		Rozhodč142 H.	Rozhodč144 S.	Rozhodč151 P.	Rozhodč152 Q.	Rozhodč156 U.	P
20.05.16 20:00	34	748	751		Rozhodč101 P.	Rozhodč106 U.	Rozhodč127 Q.	Rozhodč124 X.		P
20.05.16 20:00	35	732	751		Rozhodč122 L.	Rozhodč121 R.	Rozhodč126 P.	Rozhodč125 J.	Rozhodč137 B.	P
20.05.16 20:00	34	742	751		Rozhodč129 D.	Rozhodč127 V.	Rozhodč128 G.	Rozhodč123 E.	Rozhodč120 H.	P

Figure: Referee schedule

ARAS allows you to manage multiple competitions simultaneously, ensuring the so called referee sharing, which means that the referee can be delegated within multiple competitions and the system keeps track of his workload across all competitions. The same principle is being applied to the international matches.

The system also supports the agenda of travel expense reimbursements and referee remunerations with possibility to export the data into the economic system.

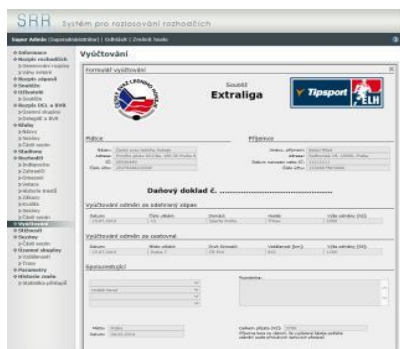


Figure: Fees and travel reimbursement form

Another feature for supporting the methodological development of referees is our Videobank. Its main functionality is maintaining the library of clips with possibility of advanced filtering and with fulltext searching for easier and faster match of searched situation.

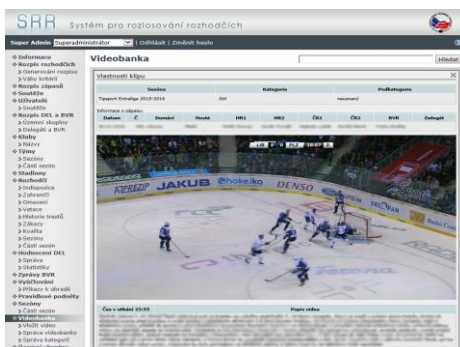


Figure: Videobank

ARAS also disposes of referees penalty records and registration of complaints on the referees and the supports all the communication related to these activities. Information predestined for the public are afterwards automatically published on the website of the governing bodies of the competition.

Newly, we have developed new functions such as Instructors support in delegation the delegates and Evaluation of the judges by the delegate and the goal judge.

Technical environment

Users can access the system through a web application which runs on a web server. The application is developed in PHP, the data are stored in a Microsoft SQL Server database. AMBICA also offers to rent the complete technical environment for the operation of the SRR system.



The benefits of our solution

Our highly sophisticated system allows:

- Fast and flawless creation of the referee schedule, i.e. the preparation of the whole season with minimum labour input.
- Monitoring, whether all referees are informed and have confirmed their attendance.
- Connection to the application at any time and "anywhere" with secure https protocol.
- Modification of the algorithm for referee assignment for a match according to pre-set criteria and their scales.
- Referee sharing between competitions including international matches.
- Statistics creation across multiple competitions (referee workload, etc.).
- Automatic monitoring of double-delegations of a referee across competitions.
- Quantifying costs (rewards for match, travel reimbursement, etc.) and monitoring the status of the billing.
- Integrated records of complaints and penalties, connected with a public website of the governing organization.
- Interconnection of the SSR system with other information systems of The Czech Ice Hockey Association – HoSys, BYZNYS and with electronic record on the match.

Main bonuses

- Facilitation of the process and lowering the amount of "manual" work
- More objective process of referees assignment (according to exact rules, without personnel and emotional influences, documentation of the delegation process)
- Travel expenses optimization

Reference

The Czech Ice Hockey Association (ČSLH - Český svaz ledního hokeje) cooperates with AMBICA company on the ARAS solution since 2010. The system was first used for the season 2011/2012, specifically for the Extraleague and next season it has expanded also for the ice hockey premier league.



Since the 2013/2014 season, ČSLH uses the new generation of ARAS solution described in this document. This solution enables also **sharing referees** across **several competitions**. Nowadays, our solution allows ČSLH to manage nominations of about 450 referees within nine national hockey competitions and also managing international matches.

AMBICA

AMBICA s.r.o. is Czech software and consulting company specialized on **delivering intelligent software solutions** and **Business Intelligence**.

AMBICA portfolio solutions covers a significant range of needs in the area of the support of business processes, ranging from issues of data integration, through sophisticated data analysis and reporting solutions to systems for planning support and performance management of organizations and other specialized applications.