

Appendix D. Description of the basic algorithms of work of Scoring machines Server.

In the present article the main principles of functioning of Scoring machines Server are described and also the following the most important mechanisms of data exchange between Global Information System Fencing Competitions nodes:

- Mechanism of task of the participants on the piste, ,
- Mechanism of getting the bout condition on the piste in on-line mode,
- Mechanism of getting the final result.

The following additional but important mechanisms are also described:

- Mechanism of substitution of the athlete for a reserved one in team events,
- Mechanism of referee request on the piste of the next or previous bout (in the pouls, table or team events)
- Mechanism of calling of the specialists on the piste (e.g. technician, doctor, e.t.c).

Scoring machines Server is a key node of Global Information System Fencing Competitions interworking with all the nodes of Green Level.

All the principles and mechanisms of functioning are described with the use of abstract commands, described in **Appendix B. Abstract commands.**

1.Startup and connections

For all the nodes of Global Information System Fencing Competitions the general rule is acting: each node must be self-sufficient and independent. This rule must be treated in the following way:

Let the node A must receive an information from the node B, if during the start the node A does not find the node B, the following rules must be complied::

- **(independence)** The node A must be launched and continue the trials to get connection with the node B till the moment when either the connection will be found or the node will be forcibly switched off.
- **(sufficiency)** the node A must fulfill all the functions which it can perform without getting the information from the node B

I.e. it is forbidden when the node A cannot get connection with the node B and stops its work.

e.g. During the launch Master did not find Scoring machines Server but in the same time Additional device tries to connect to Master. In that case Master must find the connection with Additional device and start to send information to it about its time, score, condition of the lamps e.t.c (i.e. everything except for the last names of the participants, phase of the competition and other information which it gets from Scoring machines Server).

Master startup and connections

The following commands are used: HELLO, INFO

During the startup Master goes to the «Registration in the system» mode where it sends HELLO command to Scoring machines Server every second.

Scoring machines Server, having received HELLO command from Master fixes the fact of the connection with the Master and starts to send HELLO command to it every 4 seconds.

Master having received HELLO command from Scoring machines Server goes to the , «Operating mode» mode and in response sends the INFO command with its current condition.

Later, Master being in «Operating mode», every time, having received HELLO command from Scoring machines Server in response sends INFO command with its condition.

If during of more than 8 seconds Masters does not get HELLO commands from Scoring machines Server it goes to «Registration in the system» mode. In this case it continues to function and sends INFO commands to all the nodes (Addition devices and Scoring machines Server) every time when there is an Important event on the piste.

Simultaneously with the process of finding of connection with Scoring machines Server and independently from it there is a process of connection of Additional devices to Master.

If Additional device wants to be connected to Master it must send the HELLO command to it.

Having received HELLO command from Additional device, Master checks if there is connection with it. If there is the connection it sends INFO command to it with its current

condition. If not yet it remembers it in its memory and also sends INFO command to it. Later Additional device sends HELLO command to Master every 4 seconds.

Scoring machines Server startup and connections

The following commands are used: HELLO, INFO, BROKEN

Scoring machines Server is a passive node i.e. it does not initiate interaction by itself. After startup it awaits an incoming of the commands from different nodes.

Having received HELLO command from any node it defines a type of the sent node: Master or Manager¹.

If it is a new node it remembers it and sends HELLO command in response of. If there is such a node in memory it marks time of the command receiving and also in response sends HELLO command.

Every 4 seconds Scoring machines Server sends to all known to it nodes of Master type HELLO command and awaits the INFO command from it.

If INFO command does not come from any Master for more than 8 seconds Scoring machines Server marks that the connection with the present piste has lost and sends to Server of the Results and all known to it Manager nodes a BROKEN command with mentioning the number/name of the piste.

Later Scoring machines Server every 4 seconds sends and continue to send BROKEN command to Server of the Results and to all the know to it Manager nodes.

As soon as Scoring machines Server receives INFO command from Master with which the connection has been lost, it marks that the connection is found, stops to send BROKEN command and resends to Server of the Results and known to it Manager nodes received INFO command.

Each node of Manager type implements the control and processing by itself in case of disconnection between Scoring machines Server and Manager node.

There is no special connection with Server of the Results and all the commands are always sent (or there is an attempt of their sending) regardless of if there is the Server of the Results node in the network or not.

Manager startup and connections

After startup Manager nodes every 4 seconds starts to send HELLO command to Scoring machines Server and is awaiting of HELLO command in return. Manager does it with the moment of start and till the end of its work.

If a responsive INFO command from Scoring machines Server did not enter during 2 seconds it means that the connection was not found or was lost. The order of processing of the present situation is set by Management fencing competitions system by itself.

Incoming of HELLO command from the server is a sign of the reset connection.

¹ Management fencing competitions system is a complex set to several computers (servers, clients, reservation systems, e.t.c.). I.e. the computers on which the software is set and which interact with Scoring Machines Server and Server of the results are called **Manager**.

Server of the Results startup and connections

There is no special connection of Server of the Results to Scoring machines Server. Every time when Scoring machines Server must send the command Server of the Results it does it (or tries to do it) regardless if there is Server of the Results in the network or not.

2. Mechanisms of interaction of the nodes.

Mechanism of appointment of the participants on the pistes.

The following used commands: DISP, INFO

Management fencing competitions system is responsible for setting of bouts parameters on the pistes (last names, name of the teams e.t.c). In order to set bout parameters on the piste, one of the Manager type node forms DISP command with mentioning of all the parameters of the oncoming bout (name of the piste, participants, stage of the competitions, e,t,c,) and sends it to Scoring Machines Server.

Scoring Machines Server having received the present command automatically resends it to Master node on the corresponding piste.

Master having received a DISP command analyzes its condition. If in the moment of receiving of the command the bout on Master is activated, it means that the current bout is not finished and the received DISP command is ignored.

If the bout on the piste is not activated Master remembers the received information about the bout and shows it on its screen depending on its functional abilities.

Having received DISP command, Master forms INFO command with the current condition of the current bout and sends it to Scoring Machines Server. However if the bout in the moment of receiving DISP command was not activated and the new parameters were saved, INFO command will contain them. Otherwise INFO command will contain the parameters of the earlier activated bout.

Therefore, Manager, having sent DISP command with the new data of the bout must wait several seconds and having received INFO command from Scoring Machines Server be sure that the correct athletes are on the piste. If for some reasons Master did not accept DISP command (command has not been reached because of technical reasons or the bout on the apparatus has not been activated, e,t,c) the incoming commands from master INFO commands will not be changed (the data of the previous bout will be there) and Manager will be able to identify and process it using its own algorithm.

Later, every time when Master forms INFO command with the condition of the current bout on the piste it uses the saved data about the parameters of the bout received with the use of the last not ignored DISP command.

A specificity of the team events is that they can be held with the mentioning of the last names of the athletes in each round or without them (only the names of the teams are shown)².

If the last names of the athletes in each round are not shown, the order of the setting of the parameters of the bout is the same as in individual events. The lines "Member of the team" in DISP and INFO commands are not used.

If the last names of the athletes participating in each round of team events are mentioned, the following method is used:

На дорожку посылается команда DISP, которая содержит не только наименование команды, но и фамилии членов команд - участников первого раунда.

After the end of the first round a referee finishes the bout as he does in individual events. По окончании первого раунда судья завершает поединок так же, как это делает по окончании личной встречи (см. ниже – Механизм получения итогового результата).

² I.e. either one big team match or as 9 individual matches.

Manager having received the information about the end of the first round (see below – Mechanism of receiving the condition about the bout on the piste in real time mode), forms the DISP command which contains the last names of the members of the team – participants of the second round and sends it to the piste.

e.t.c, i.e team match consists of 9 matches each of which is set by a separate DISP command.

One of the peculiarity of team matches is the presence of TEAM command which contains the list of team members and their order on the piste in the current bout. Manager forms and sends its this command to Scoring Machines Server, which resends it to a proper Master. TEAM command can be sent once – after DISP command with the participants of the first round or every time after DISP command with the participants of the next round.

Every time when Manager sends TEAM command to it repeats it on Scoring Machines Server.

Mechanism of confirmation of TEAM command by the receiver node must be provided by the protocol implementing the interaction between the nodes³.

Mechanism of receiving of condition of the bout on the piste in real time mode

The used command: DISP, INFO, HELLO

INFO command is used for sending the condition of the bout on the piste. The parameters contain all necessary data (name of the piste, score, time of the bout, condition of the bout, e.t.c).

Master forms and sends INFO command in following cases:

- If HELLO command has been received from Scoring Machines Server - in this case Master automatically sends INFO command to it;
- If HELLO command has been received from Additional device – in this case Master automatically sends INFO command to it;
- One of the important events⁴ have happened – in this case Master forms INFO command with its current condition and sends it to Scoring Machines Server to all known to Master Additional devices;
- DISP, ACK or NAK command has been received from Scoring Machines Server – in this case Master after command processing automatically sends INFO command to it;

Scoring Machines Server having received INFO command from any Master automatically resends it to Server of the Results and to all known to it Manager nodes. Thus, all the nodes of Manager and Server of the results receive this command in real time mode.

Manager type nodes are proceeded by received INFO commands using their own algorithms.

³ E.g., Cyrano 2.0 protocol obtains each TEAM command a unique ID. INFO command contains a parameter – ID of the last received TEAM command. Thus, having compared ID from INFO and TEAM commands it can be suggested whether the TEAM command is received or sent.

⁴ The list of all the important events is in Appendix C. Important events on the piste

Server of the Results having received INFO command from Scoring Machines Server automatically resends it to all the connected to it nodes of Yellow level (see Appendix E. Server of the results).

Thus, all Global Information System Fencing Competitions nodes can receive information about the bouts condition on the pistes in real time mode.

Mechanism of getting of the result.

The used commands: INFO, NAK, ACK

After the end of the bout the referee using Master interface gives a command to apparatus to 'finish the bout'. Master changes the condition of the bout to "the confirmation of the ending of the bout has been requested", forms INFO command and sends it to Scoring Machines Server.

Scoring Machines Server having received INFO command with a field data 'Condition of the bout' equal to 'the confirmation of the ending of the bout has been requested' checks the correctness of the results. The result is considered correct if based on the received data it is possible to define the winner and if there are no mistakes in score. For example, if there is an equal score and there is no priority sign such a score is considered incorrect. If the score is equal and the priority is not equal to N (e.g. Right) the result is considered correct (the winner is on the right).

Besides, during checking of the result correctness such parameters as type of weapon, maximum number of hits, duration of the match and number of matches are used by the earlier sent DISP command.

If Scoring Machines Server has accepted the result as the correct one, in response it send ACK command. If the result is incorrect it sends NAK command.

Scoring Machines Server conducts the checking in the moment of incoming of the INFO command with the status "the confirmation of the ending of the bout has been requested".

Master having received NAK command from Scoring Machines Server changes the condition of the bout to 'the bout is activated but the timer is not starts or is stopped', informs referee⁵ about the incorrect result, forms INFO command and sends it to Scoring Machines Server

Master having received ACK command from Scoring Machines Server changes the condition of the bout to 'the bout is finished and deactivated', forms INFO command and sends it to Scoring Machines Server. However the current bout becomes deactivated and Master is ready to accept DISP command with new parameters and set them.

Manager as any other node, having received INFO command with the field value "Condition of the bout" equal to "the bout is finished and deactivated" and proceeds it using its own algorithms.

⁵ With the use of its own interface.

Mechanism of substitution of the athlete for a reserved one in team events.

The used commands: REPLACE, INFO The present mechanism is used only in team events and only when the bouts are held with using the names of the names of the athletes. In case of substitution of the athlete the Referee of the bout must, with the use of Master interface, point the side and number of the substituted athlete. Master, based on this information, forms REPLACE command and sends it to Scoring Machines Server

Scoring Machines Server having received REPLACE command resends it to Server of the Results and all known to it Master nodes.

Manager node having received REPLACE command processes it. In case if the substitution is for the present not started yet bout, it forms new DISP command and sends it to Scoring Machines Server. Otherwise, it takes into consideration the happened substitution while forming the next DISP commands.

The possibility of sending REPLACE command must be unavailable during the activated bout.

Mechanism of requesting of the referees on the piste on the next or the previous bout.

The used commands: DISP, PREV, NEXT

In several cases Referee needs to request previous or next participants (e.g. in poules). For doing this Referee must, using Master interface, chose previous or next bout. Master, based on the Referee's choice forms PREV or NEXT command and sends it to Scoring Machines Server.

Scoring Machines Server having received NEXT or PREV command to all the known Manager nodes.

Manager node having received NEXT or PREV command processes it. It forms new DISP command and sends it to Scoring Machines Server.

In case if during 4 seconds DISP command was not received, the request is considered to be failed.

The possibility of sending of NEXT or PREV command must be unavailable during the activated bout.

Mechanism of calling of the specialists on the piste.

The used commands: INFO

In several cases Referee needs to call a technician, doctor, video engineer or TD representative. For doing this the Referee using Master interface, choose a specialist whom he is calling. Master, on the ground of Referee's choice sets certain characteristics in INFO command and sends it to Scoring Machines Server.

Scoring Machines Server having received INFO command resends it to Server of the Results (which resends it to all connected to it nodes of the Yellow level) and to all known to it Manager nodes. Thus, any of Global Information System Fencing Competitions nodes receive information about the calling of the specialist to the piste. The producer of each node defines the algorithm of processing of information about the calling of specialist.

In order to cancel the call of the specialist to the piste, the Referee must, using Master interface give a certain command. Master on the ground of the cancel of the call clears certain characteristics in INFO command and sends it to Scoring Machines Server.

Scoring Machines Server having received INFO command resends it to Server of the Results and to all known to it Manager nodes.

The option of calling of the specialist must always be available including during the activated bout.