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## Contribution to Increasing of People Security under the Realizations of High Risks Meetings

### Abstract

*For needs of basketball competition “EuroBasket 2005” certain measures of protection of actors, visitors and object were undertaken. One of the measures was introducing of a special system for access control. The system was based on RFID and bar code technology. Control of visitors, guests as well as staff was realized. The idea was to avoid excesses and overcome the problems connected with possible terrorist attacks and vandalism. The paper considers technical solution of the problem as well as the practical realization of the system in the sport arena “Center Millennium” in Vrsac, Serbia and Montenegro.*

**Keywords:** RFID, safety, vandalism, terrorism, EuroBasket 2005, Center Millennium

On September 2005 in Serbia and Montenegro was big basketball competition „EuroBasket 2005“. Owing to the importance and character of the event, actual reality and danger of vandalism and terrorism, certain measures of protection was undertaken. One of the measures was connected with access control and sale of tickets-passes. The tickets were sold with making evidences about buyers, i.e. with taking of some personal data of the buyers. Contents were on several locations and on different locations different protection measures were undertaken. For the sport arena “Center Millennium” in Vrsac the complex system based on Mifare® cards and bar code readers was developed. In this paper description of the technical solution of making reservations, tickets sale and access control is presented.

Key units of this system are:

- *ITG TicketSales*: application software for booking/ticketing
- *ITGTicketControl*: application software for access control in sport hall
- *ITG Pass*: application software packet for season tickets selling and updating (smart cards)
- *ITGbtt 0x*: revolving barrier with barcode readers and smart cards readers (Mifare cards)
- *ITGsr 05*: smart card readers for access control and working time registration
- *ITG Fitness*: application software package for Fitness center administration

Each one of these units had been developed and manufactured by company SDD ITG - Beograd. Complete system is based on very flexible concept so it could be modified very easily to satisfy different demands of needs and structures of various types of arenas. It could be used, also, for all large objects, sport arenas as well as for cinemas, theatres, concert halls etc. Normally, it could be used for all buildings with a circulation of a lot of people, especially for the objects with abiding visitors: faculties, schools, hospitals etc.

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## **Project demands for the sport arena “Center Millennium”**

Arena “Center Millennium” is modern object designed for sport-oriented events. It was built in the last decade of the past century. With its dimensions and reach equipment it belongs to the top of such objects in Balkan.

Because of its size and variety of content, object of arena is divided into the following complexes:

- Booking office and audience entrance
- Staff entrance
- VIP (very important people) entrance
- Fitness center
- Entrance to the offices
- Reservation tickets issuing

There are two types of tickets for sport event visitors:

- Daily tickets and
- Season tickets.

Daily tickets are used for one entrance in the sport center. Because of practical reasons, they are printed on paper. Among the usual data and protection elements, daily ticket has its own serial number printed in two ways:

- Combination of letters and numbers, and
- Barcode form (striped code).

Season tickets (passes) are used for multiple entrances in the sport center and they are made of plastic card having electronic chip inside (contactless smart card). Alternatively, they may be fabricated in form of key fob, bracelet, etc. Discount policy and benefits of the season tickets may be different, for example: time limitation, number of entrance limitation, etc. Anyway, there is a chance for creating flexible selling policy.

Employee from Center has its company ID cards, which are technologically identical to season cards. Cards for fitness center users are technologically identical to season tickets, i.e. season tickets are used as multi application cards, both for sport events and fitness center.

VIP tickets are technologically identical to season tickets. To accomplish visual distinction with other identification cards, VIP tickets are printed in different color.

By creating this solution special attention was paid on meeting the following goals:

- Providing technologically modern solution, which will beneficiary allow flexibility from created optimal policy of using available resources
- Providing protection of potential misuse
- Providing the chance for upgrading system by adding new functions.

## **Concept solution**

Season tickets, VIP tickets and company ID cards are technological identical. They are manufactured like standard credit cards and they have inside electronic chip with memory (contact less smart card) of the read-write type. Philips Mifare® technology was applied to these cards (ISO14443A). These cards were personalized with unique identification parameters of each user. Visual identity of the cards was done in true color according to graphical solution by administration of sport Center

ID card ensures its owner entree resources of the Center, consistent to defined policy. Also, ID card might be used for paying some services in the sport Center (vending machines, etc), used as an electronic wallet.

As it was mentioned, daily tickets are made of paper, and because of barcode form (striped code), they provide machine readability.

Every ticket, either plastic or paper, has its unique identification (ID) number. ID number of the plastic card was registered in factory, readable by all readers installed as part of the project. The number is unchangeable and it provides safety against cheating. ID number of every card which had been sold, was registered in data base center. Entrance in sport hall was secured with three-armed barriers (tripod turnstiles) that have card readers. Barrier reads both types of cards, with automatic recognition of the card type.

When barrier reader reads daily ticket, the control system checks status of that card according to ticket's ID number. If ticket isn't used before, three-arm barrier lets the person enter the gate and marks ticket as used. If user tries to enter in sport hall again with the same ticket, barrier will be locked and sound alarm will be put on as a signal of using defective ticket.

When barrier reader reads season ticket and if ticket is valid, three-arm barrier lets a person enter the gate and evidence is made (date, time and ticket ID number). Due to the fact that daily tickets have read/write memory in which readers can read and write, it is possible to make very large spectrum of system functions. For instance, instead of defining ticket's end date validation it is possible to define a number of permitted entrances in the sport Center. In that case, when barrier reader reads reservation ticket and if ticket is valid, three-arm barrier lets the person to enter the gate and decrements the number of permitted entrances. When that number becomes 0, ticket is not valid any more, unless user renews it by visiting ticketing booth. The ticket can be used until its mechanical or overheating damage.

Paper cards are possible make on usual way with adding of bar code.

Plastic cards, uninitialized, as they are standard ISO 14443A complaint, could be bought on free market.

ITGsr-05 terminal with two external antennas is mounted at the staff entrance, used for the time of the attendance registration.

Tickets sales, both daily and season are done at the booking booth. Desktop reader ITGpc-05 together with appropriate software package is used for personalization of season tickets and staff IDs.

All readers (in tripod turnstiles and wall terminals), ID cards personalization center as well as PCs at the booking booth are connected to access control LAN supported by access control server, where data base of all active tickets is being held.

Bearing in mind the number and structure of potential users, special attention has been paid to provide the system as vandal-proof and secure from potential misuse.

### **Daily tickets booking/sales**

Application software package ITG-TicketSales was developed using Microsoft® tools (C#, .NET). The package is configurable for sport arenas of various structure, size and price policy.

Because the arena could be used for different events, not only basketball, an EVENT (DOGADJAJ on Fig. 1) has to be selected first, what defines all relevant data on hall configuration for this event. These relevant data are: available number of seats, their disposition and numeration. Booking and sales of seats are done by simply selecting of desired seats on graphical presentation of the hall. It is possible zooming of desired area, selecting of seat as well as selecting of a group of seats, etc. An example of staring view of desktop is shown on figure 1.

Season tickets could be renewed after expiration date, bought or returned, on easy way by using software package ITG-Pass. Entry screens are shown on Fig. 2 and Fig. 3.

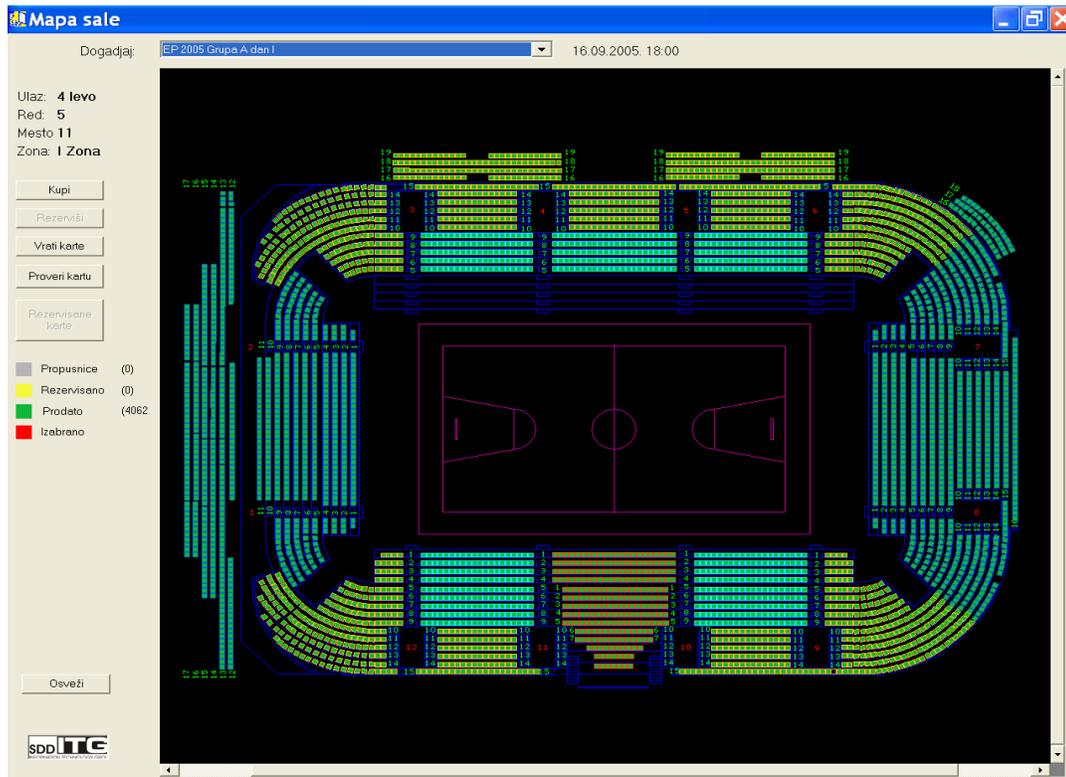


Fig. 1 Map of the arena

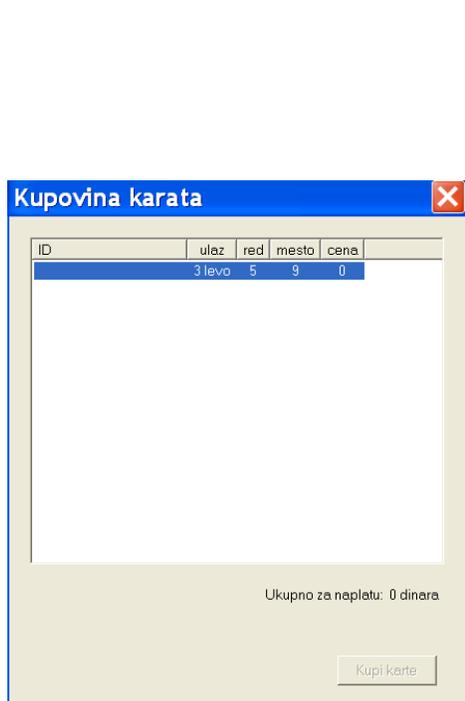


Fig. 2 Sale of tickets

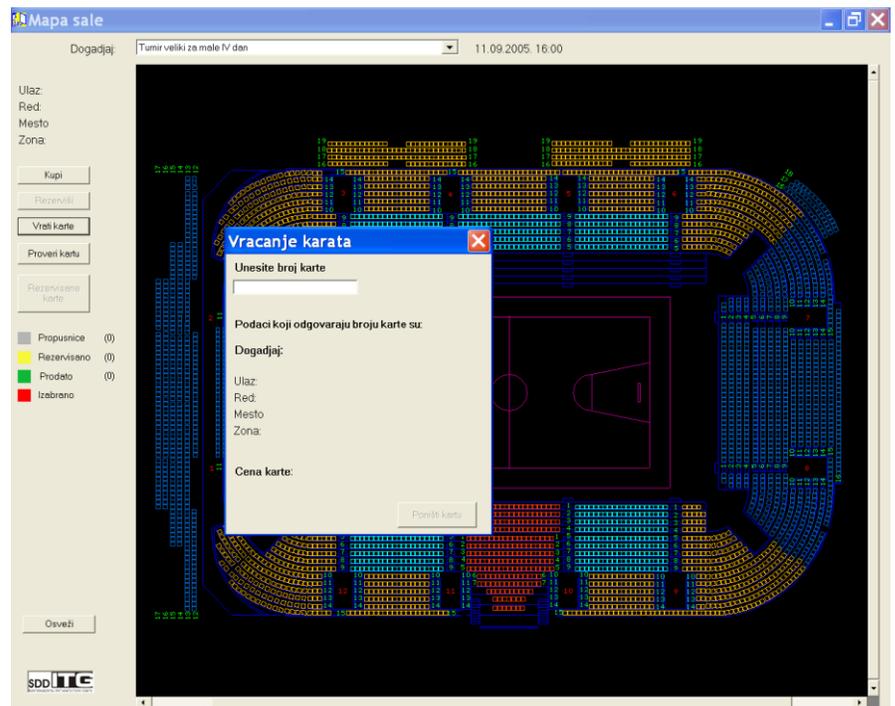


Fig. 3 Returning of tickets

Among the function of dealing with tickets, software give a possibility of returning non-used tickets. Returning of tickets is in graphic environment too. Number of returned ticket is to be entered in the command line of the mask. Input of the ticket number can be manually, as well as automatically by bar code reader.

## Season tickets sale

Entry passes are season's tickets realized on the base of smart cards (Mifare® standard 1kB). This is a long lasting document, and could be renewed after the expiration term. After paying of appropriate sum on the pay desk, new term of expiration can be set by using ITG-Pass. Entry screen is given on fig. 4, mask for pass's entry data is given on fig. 5, and an example of pass updating as well as paper ticket are presented on the fig. 6.



Fig. 4 Entry mask



Fig. 5 Pass sale



Fig. 6 Pass update



## Access control

Access control to the hall is under supervision of software package ITG-TicketControl, which makes decision on the action to be performed, after a paper or plastic ticket is being read out by a barrier (Fig. 7) and data base of active tickets has been consulted. There are two possible commands: open the appropriate barrier or do not open it, by sending preprogrammed audio and visual signalization. Also, a number of protective mechanisms are implemented as to prevent potential misuse of the system.



Fig. 7 Identification of visitor



Fig. 8 Entry control (view from inside)

### Barriers (tripod turnstiles)

Standard tripod turnstiles from the ITGbtt-0x family have been employed. Additional hardware was developed to provide quick and easy mounting and dismounting of the barriers, especially in the emergency cases (Figs 8, 9 and 10).



Fig. 9 Entry control (view from inside)



Fig. 10 Entry control (view from outside)

### Conclusion

The first experience of introducing RFID technology as the method of securing sports halls and sport manifestation are very positive. During the period of “EuroBasket 2005” there were no accidents there. There were no fake cards. The reason was safety of the technology but, probably, the reason was that it is new technology in this area. Bearing in mind achieved results, it is expectable that RFID technology will rapidly increase its presence in this area. It weights specially for entry passes that could be used for some additional services, including catering services in the object.

It is quite sure that RFID technology cannot be one and only means for protection of vandalism and terrorism, but it is also for sure that it can support safety of visitors of sport spectacles.