

OVERVIEW OF THE UTMS AT THE NAGANO OLYMPIC GAMES

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ABSTRACT

The 19th Winter Olympic Games, held at 6 locations in Nagano Prefecture from February 7 to 22, 1998, were the last Olympic event of this century. The Nagano UTMS (Universal Traffic Management Systems) were introduced using the ITS technology, with the aim of making operations such as transporting competitors, staff and spectators work smoothly during the games particularly as regards traffic on the roads during the Olympic period.

The UTMS were intended basically to collect detailed information, and to apply the information widely to traffic systems, and to provide timely traffic information, through two-way communications between Infrared Vehicle Detector (IRVD) and in-vehicle unit.

This report introduces the basic concept of the systems, and gives an overall description of the systems, and a comprehensive evaluation of the systems which were employed.

INTRODUCTION

During international events such as the Olympics, many people and cars from Japan and abroad, become concentrated into a limited area, so unforeseeable accidents and traffic jams may often occur.

Therefore, the general traffic management was planned by applying new traffic management systems of the ITS (Intelligent Transportation Systems) type to contribute to the smooth operation of the Olympic games by improving traffic conditions, in addition to suppressing total volume of traffic and traffic regulation, during an event.

ESTIMATED NUMBER OF SPECTATORS AND TRAFFIC VOLUME

The Olympic Games were held at the six locations of Nagano, Hakuba, Iizuna, Yamanouchi, Karuizawa, and Nozawa Onsen. The estimated number of people directly concerned with the games was 940 thousand together with a total of 1.2 million spectators during the period of the games, and a daily peak of 100 thousand people was expected. In addition, it was also expected that most of the spectators would travel in passenger car for private use, so it seemed highly probable that traffic

volume would increase greatly. Consequently, countermeasures were required.

ASSURING SMOOTH TRAFFIC FLOW

To ensure that the vehicles of those participating in the games could be driven smoothly at a time when the volume of traffic was increased, the Prefectural Police Headquarters applied various countermeasures including the suppression of the total traffic volume, special transportation routes (loop lines) for Olympic staff, special lanes used for predetermined routes to separate them from general traffic lanes, and extraordinary traffic rules. For the spectators etc. from other prefectures, using their own cars, temporary parking lots were constructed in the suburbs for a park-and-ride system, and for the spectators used railways, shuttle buses was prepared to transport the passengers from Nagano Station and other places to the locations of the various events

USE OF ITS

The organization committee prepared about 2,400 buses and passenger cars to transport competitions and staff and for other functions concerned with the games. Furthermore, a considerable number of vehicles were expected to arrive for transporting media representatives and their equipment, so a considerable increase in the traffic volume was expected. Under the circumstances, it was planned to introduce UTMS technology to the vehicles concerned with the games, in addition to suppressing the total volume of traffic and traffic regulation, so that they could travel smoothly,

STRUCTURE OF THE NAGANO UTMS

The UTMS has been mainly developed and put into service by the Association under the leadership of the National Police Agency, and is an ITS system.

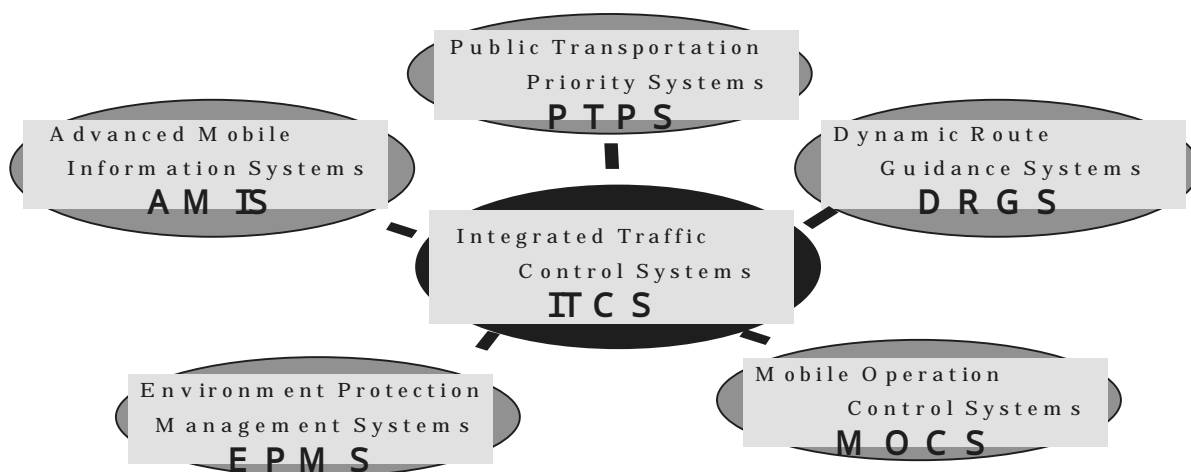
Because the UTMS can control all the traffic in a local area, the "Nagano UTMS" has been specially constructed according to UTMS principles, for the purposes of the Nagano Winter Olympic Games. In this system, IRVDs collect detailed information, and based on this information, traffic signals are controlled appropriately and traffic information is presented to drivers, for the purpose of managing the traffic smoothly.

BASIC CONCEPT FOR CONSTRUCTING THE SYSTEMS

The basic concept of the "Nagano UTMS" consists of the six subsystems (shown in Fig. 1) that constitute the original UTMS. The "Integrated Traffic Control Systems (ITCS)" including the "Advanced Mobile Information Systems (AMIS)" and the "Public Transportation Priority Systems (PTPS)" have been developed and put into operation by the Prefectural Police Headquarters. The "Dynamic Route Guidance Systems (DRGS)" and the "Mobile Operation Control Systems (MOCS)" have been developed and interlinked to cope with the vehicles directly concerned with the

Olympics in which two-way communication functions between in-vehicle units and IRVDs are utilized to a maximum.

Fig. 1 Basic subsystems of the UTMS



In particular, the IRVDs have made it possible to use the uplink function, and this allows traveling conditions to be monitored more precisely for vehicles in which communication devices have been installed. Therefore, the existing traffic control systems can be made more sophisticated by using this function, which also improves the efficiency of "information collection," "signal control," "traffic information service," "supporting operation administration," and expanding peripheral functions.

Information Collection

Traffic conditions at many locations must be collected accurately in real time, in order that high-grade signal control, traffic information service, etc. can be achieved. For this purpose, IRVDs were installed at 309 locations including 130 intersections (414 lanes) mainly on routes used by Olympic vehicles; about 2,400 vehicles concerned with the games were provided with special UTMS devices or uplink devices, and vehicle ID, link travel time information, etc. were collected as uplink information.

During the games, a sufficient amount of traffic information was collected from the regions in which the various games were held, using optical beacons and ultrasonic detectors. The quality of this information was satisfactory for operating the systems.

Signal Control (ITCS, PTPS)

To cope adequately with the characteristic, rapidly increasing traffic flow, associated with an event, the ITCS, as well as other UTMS subsystems, was introduced to make the existing traffic control systems more adaptable and to optimize the control of traffic signals. In addition, the PTPS was also incorporated so that priority could be given to the movement of vehicles (buses) related to the Olympics, to reduce traffic jams and to

assure normal driving schedules.

In addition, new control parameters were adopted for the games, and these were combined into about 60 types which were used during time intervals which had been determined in advance to correspond with the time schedule of the games.

In addition, the macroscopic PTPS system was employed from the control center; the operating conditions of vehicles related to the Olympics were collected, and priority systems were controlled accordingly to ensure time-keeping, and the smooth flow of the vehicles. At each terminal, a microscopic PTPS control system was implemented; the terminal received uplink information from the buses, and once a vehicle had deviated from a priority system, the appropriate signals were controlled from the center.

Traffic Information Service

A. Information Provided via In-Vehicle Units.

The following items of information are supplied through two-way communications between IRVDs and in-vehicle units on concerned with the Olympics.

<<AMIS>>: Vehicles with installed VICS devices coming from other parts of Japan, were informed of traffic jams, regulations, accidents, parking lots, travel time to major locations of interest, etc. using illustrated maps and simplified graphics display.

<<DRGS>>: Vehicles related to the Olympics were informed of "optimum route," "travel times to destinations," etc. using simplified graphics display, by selecting the destination by means of in-vehicle unit.

<<MOCS>>: Vehicles concerned with the Olympics were informed of "travel times to major locations," "car position indication information," etc. using simple diagrams.

B. Information Provided by Infrastructure such as Traffic Information Boards

All cars and vehicles including those not associated with the Olympics were informed of general traffic conditions using traffic information boards etc. installed at the side of the road.

In these ways, traffic accidents and jams that might otherwise be caused by travelers who were not familiar with the geography could be avoided, and these vehicles could be directed appropriately to ensure they were driven safely with a minimum of traffic jams.

Supporting Operation Administration (MOCS)

To support control operations, traffic information about the status of running vehicles, running times, road conditions, etc., was transmitted from the control center to a monitor provided to the organization committee, so that the supporting Olympic staff could efficiently transport olympic staff and maintain the punctuality.

In this way, the many vehicles concerned with the Olympics could be operated punctually and reliably, which greatly contributed to the smooth operation of the

games.

This function might become the core system for an advanced UTMS for upgrading traffic control systems, as the peripheral jobs associated with traffic control could be carried out and their functions expanded.

Supporting Police Operations

To support the police, traffic information was transmitted to the traffic control center and general police headquarters, and assigned police vehicles were traced and monitored by a location system. Also messages were transmitted to the police vehicles. In addition, abnormal traffic conditions were monitored and analyzed, and the necessary information was presented to the vehicles to support police officers.

USE OF MULTIMEDIA

The traffic control center provided integrated management and control of the various items of detailed information collected from the IRVDs and other terminals, and distributed the information widely using multimedia.

- (1) Traffic information and images at intersections were sent through the Internet.
- (2) Traffic information was supplied by automatic fax response systems and CATV.

EFFECTIVENESS OF THE SYSTEMS

The effectiveness of the systems, was evaluated and analyzed after the event using various means including questionnaire surveys. The analyses included comparisons between planning and results, such as estimated and actual travel times, bus operation time schedules and actual times, comparisons between normal values and planned values of traffic volume, traffic jam length, etc. The economic effects of introducing the systems and the resulting contributions to traffic conditions, environmental effects, user's access to UTMS, etc., were estimated.

SCOPE OF RESPONSIBILITIES

The "Nagano UTMS" was constructed as a cooperative project of the National Police Agency, the Nagano Prefectural Police Headquarters, and the UTMS Association. The agency planned the scheme, the UTMS Association carried out the research and developed the details of the systems, and the Prefectural Police Headquarters implemented and carried out the plan. The three organizations also cooperated to study the systems, periodically, in a comprehensive way as they were being constructed.

P.S. The effects of using the systems are not available at present. The effects will be evaluated from data to be collected during the games, so their effectiveness will be described in the final text.