Québec 2010
AIPCR · PIARC

XIII INTERNATIONAL WINTER ROAD CONGRESS

QUÉBEC, FEBRUARY 8 TO 11, 2010

SUSTAINABLE WINTER SERVICE FOR ROAD USERS

THE INTRODUCTION OF THE SNOW VEHICLE POSITION MONITORING SYSTEM AND ITS EFFECTIVENESS

Masatoshi YOKOTA

East Nippon Expressway Company Limited,

JAPAN Engineer

m.yokota.ab@e-nexco.co.jp

WORLD ROAD ASSOCIATION MONDIALE DE LA ROUTE
AIPCR PIARC

Québec

NEXCO 東日本

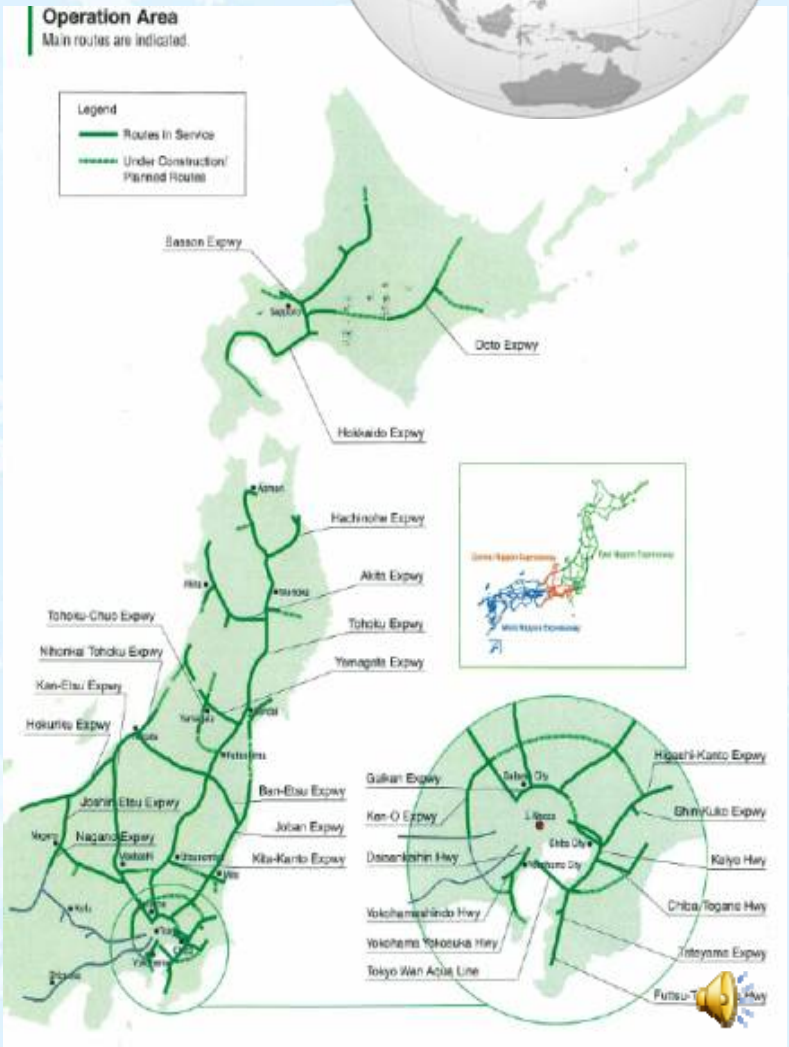
Overview of E-NEXCO

◆E-NEXCO: East Nippon Expressway Co.,Ltd

One of the largest toll expressway operating companies in Japan.

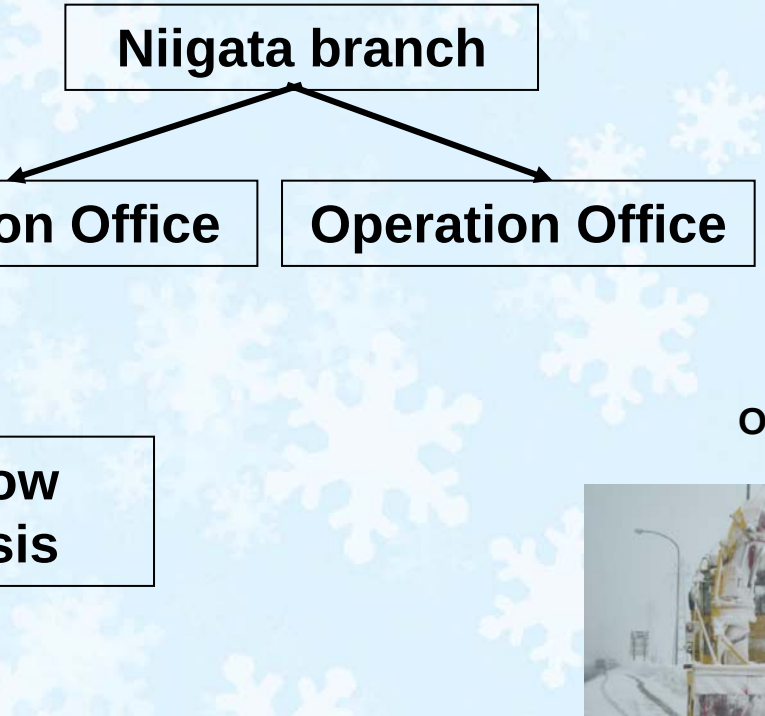
- **3,544km: in operation**
- **324km: under construction**
- **250 million vehicles in daily use**

AS of 31NOV.,2009



AIPCR · PIARC Québec 2010

Hierarchy of Our Snow Operations



Overview of operation Office.

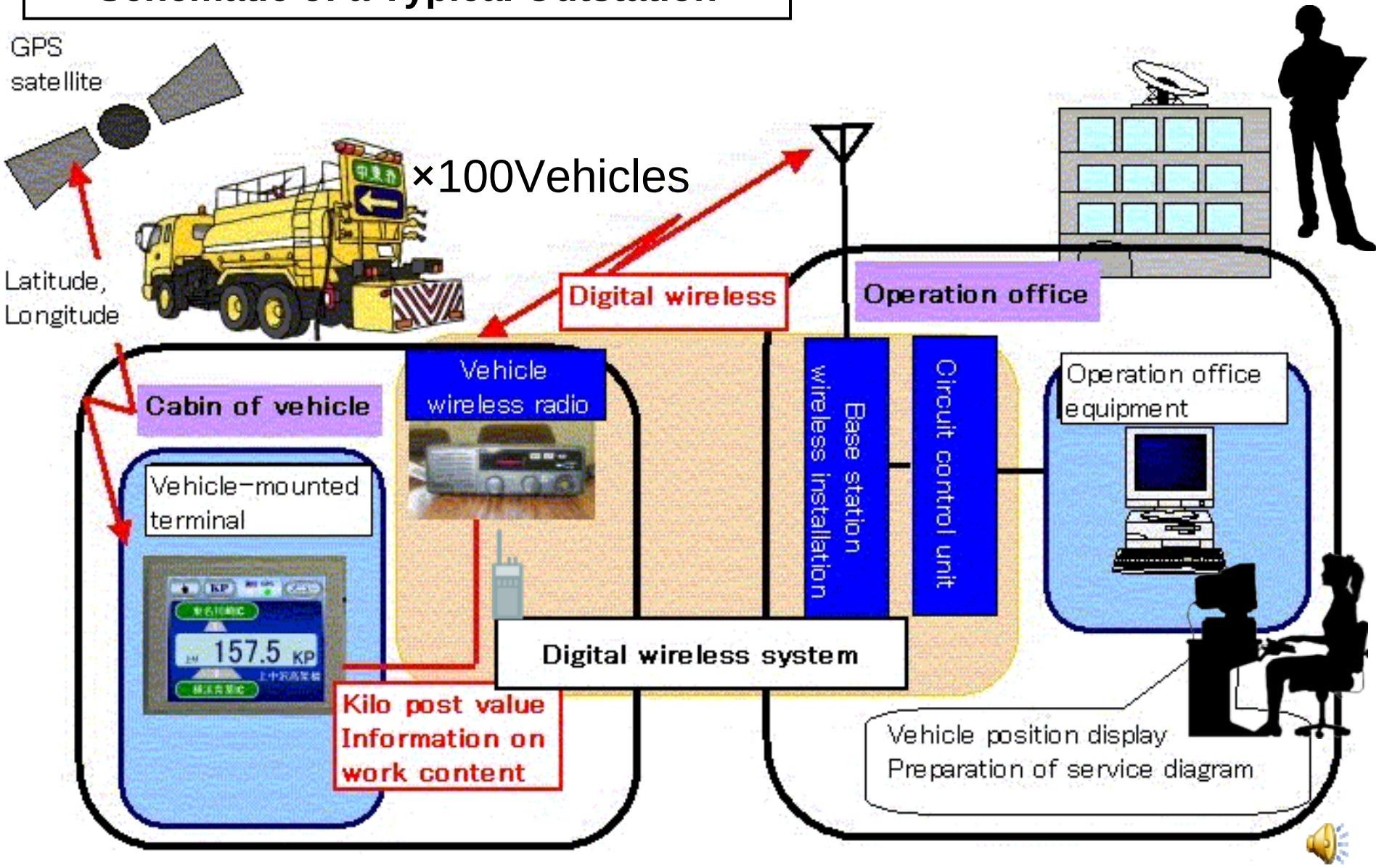
- **Road Salting** (Anti-freezing agents)

- **Snow Removal**(winter service vehicle like,removal vehicles, Snowplow, Snow blower,Snow sweeper, Gritter, Snow groomer)

Snow Operation vehicles in Niigata,Japan

SNOW VEHICLE POSITION MONITORING SYSTEM

Schematic of a Typical Outstation



Historical Developments

-Snow Removal Machinery plays an important role

-There was previously no way to obtain overview of the progress(position) of local snow vehicles in real time.

Vehicle-Mounted Terminal Control Unit

Vehicle-Mounted Terminal Display

By Using our system,,, Connecting with private radio,Using GPS…

- Location,State of apparatus(Both Machinery & Vehicles)
- Display Position in the Vehicle on the highway(called “Kilo-Post”)

The system had the following disadvantages:

-difficult to understand-The Humane Interface is poor

-uncertain-Radio waves(weak) causing radio congestion

-No Data Storage Function

Concrete Issues

～Upgrading For More Efficient

There were serious matters on the system in Winter road maintenance such as;

The summary states:

① Accuracy--The real-time Progress of Snow Removal operations

② Accuracy--Prevention of Radio(Data) Collision

③ Efficiency--Past Operation Record could be reviewed

④ Improvement of Crisis-Management

Solution by the System

① Accuracy--The real-time Progress of Snow Removal operations

（BEFORE）Complicated and Troublesome for Operator

Because of only Voices Recognition(Response) and Many Vehicles

（AFTER）

- ◆Visual on the Display and Renewal Every 1min.(including Busy Time)
- ◆Data Storage by Automatic Data Collection Server

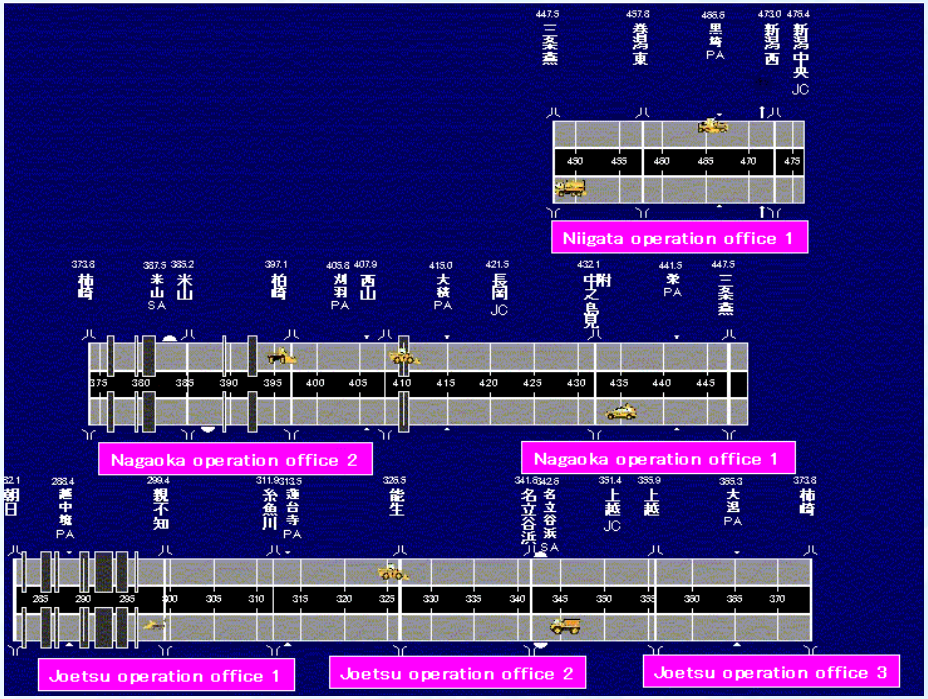
☆Comparison of Our Old-Now System☆

-the Certain Data Transmitting to the Center Server

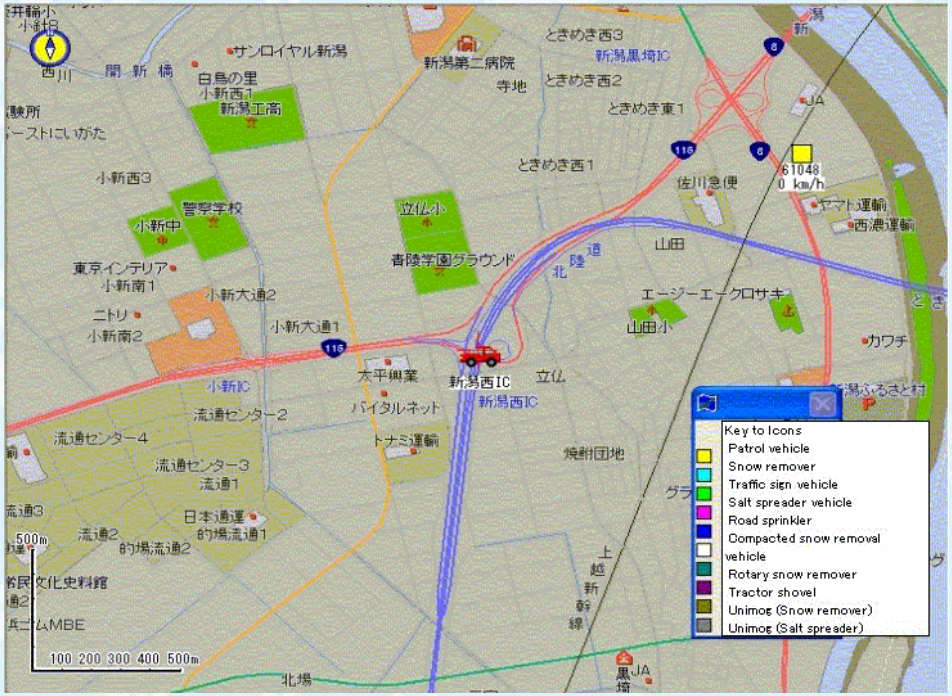
(Auto-Negotiation,Data Storage, Retransmission)

-More Advanced Networks(Collision Detected)

Schematic Diagram1

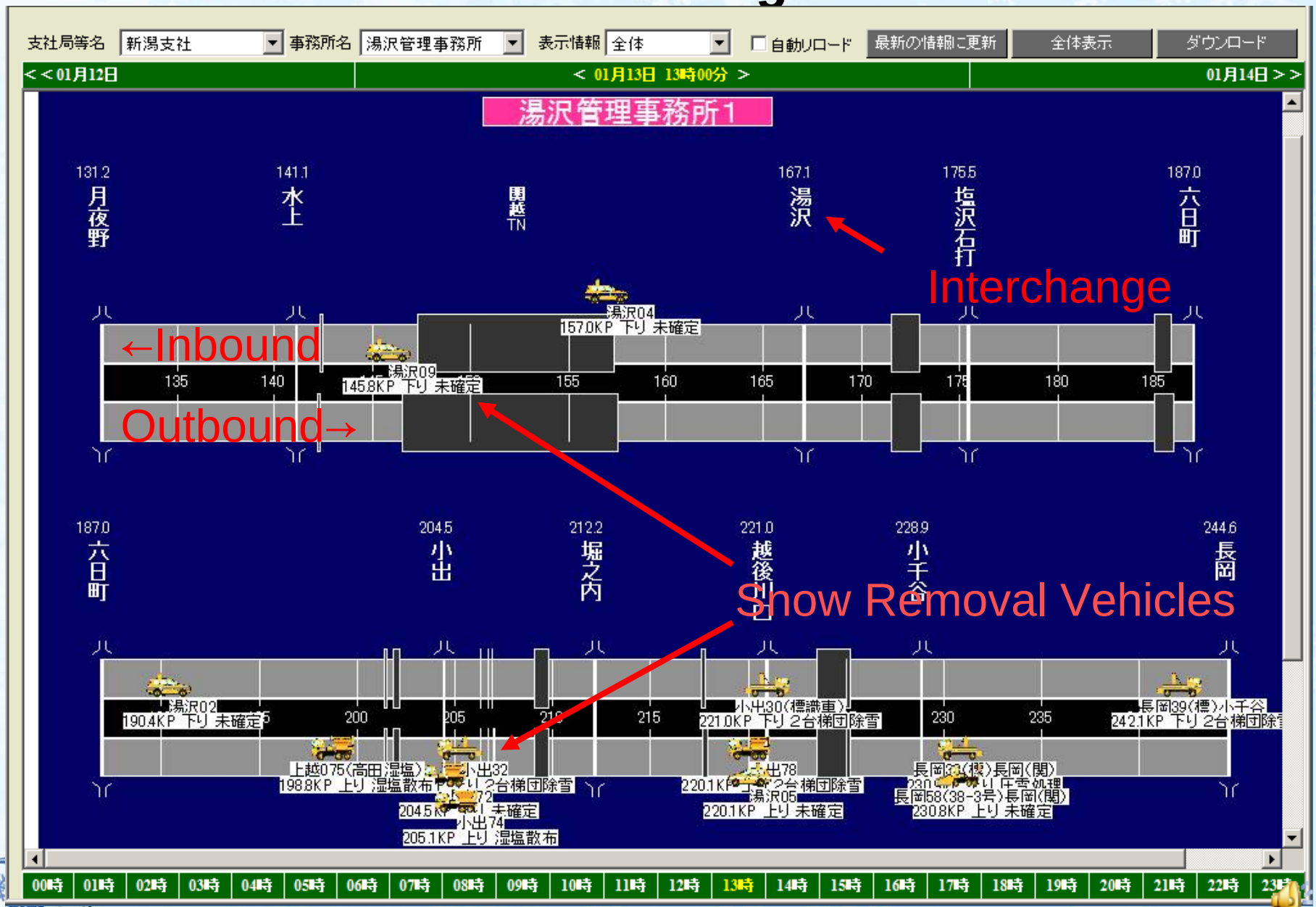


A Simple schematic diagram



Screen showing current position

Schematic Diagram2



Screen showing current positions

Solution by the System

② Accuracy--Prevention of Radio Collision

（BEFORE）Unicast(Analog)

Radio(Network) congestion sometime happened

because of calls over the wireless equipment with limited radio resources

（AFTER）Multicast(Digital)

◆Position,Work Content Data(e.g.,snow removal)…non-streaming

◆Audio Data…streaming data

>>decrease total streaming amounts

Solution by the System

③ Efficiency—Past-Operation Record Could be Reviewed

（BEFORE）

・With Manual Service, the Operator makes the document for procedure.

（AFTER）

◆Automatic Service, came into existence after the system.
Their Purpose was Replacing human operators in tedious task.

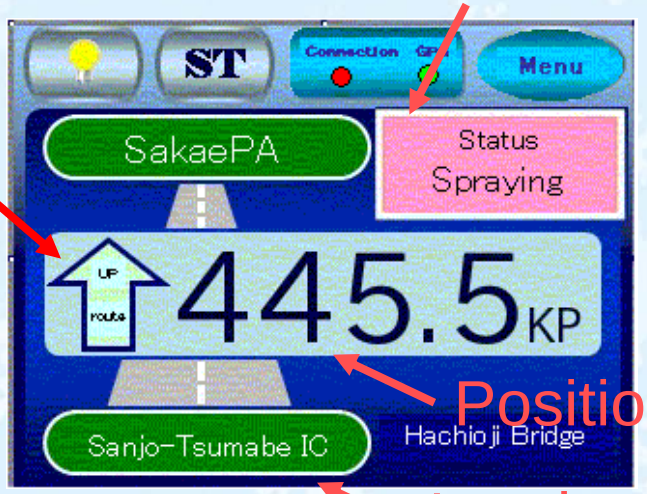
◆Vehicle Mounted Terminal User Interface Re-design
--Visual Elements,Operational Elements

☆ comparison of old-now system ☆

- Touch-Sensitive Screen adapted
-Easy Position Recognition on the Display by the schematic diagram

New Snow Vehicle Position Monitoring Terminal

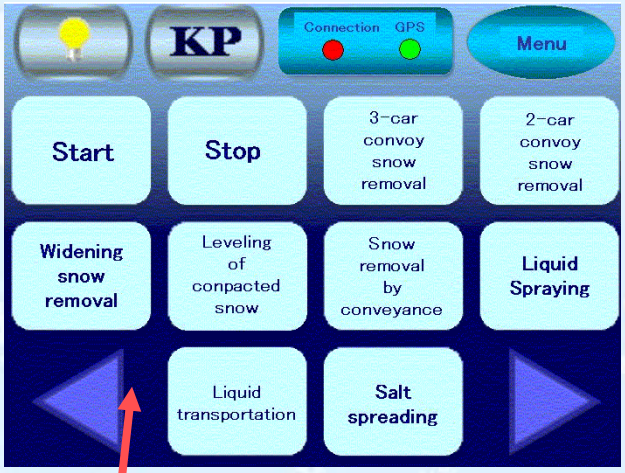
Inbound



Status

Position

Landmark



The new snow vehicle position monitoring system

Monitor screen

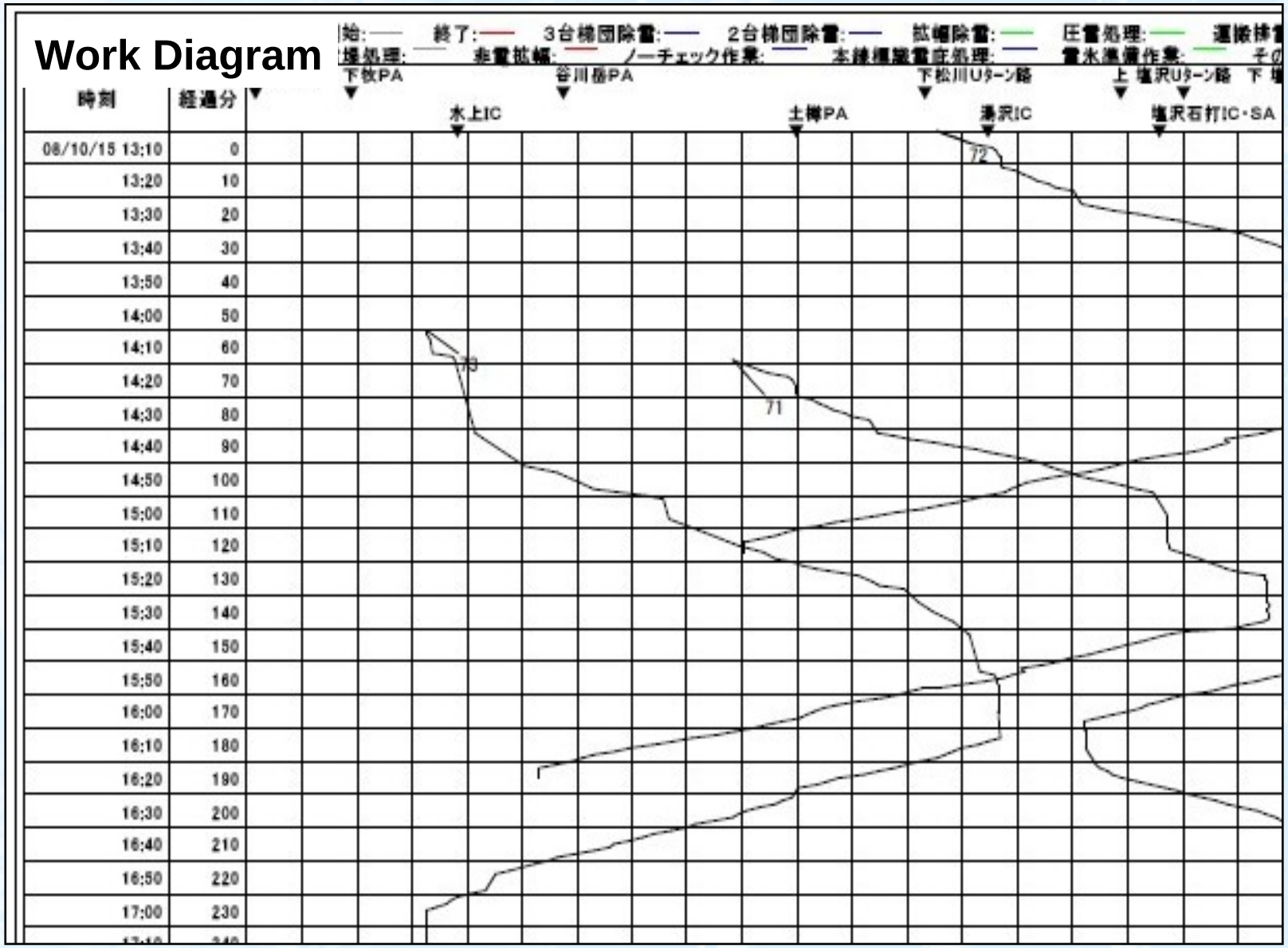
Select Mode
With Touch Panel

Québec 2010
AIPCR · PIARC

Work Diagram

Location

time



Diagram

Solution by the System

④ *The* Improvement of Crisis-Management

（BEFORE）ONLY Voice(Audio,Call) from Driver on vehicle

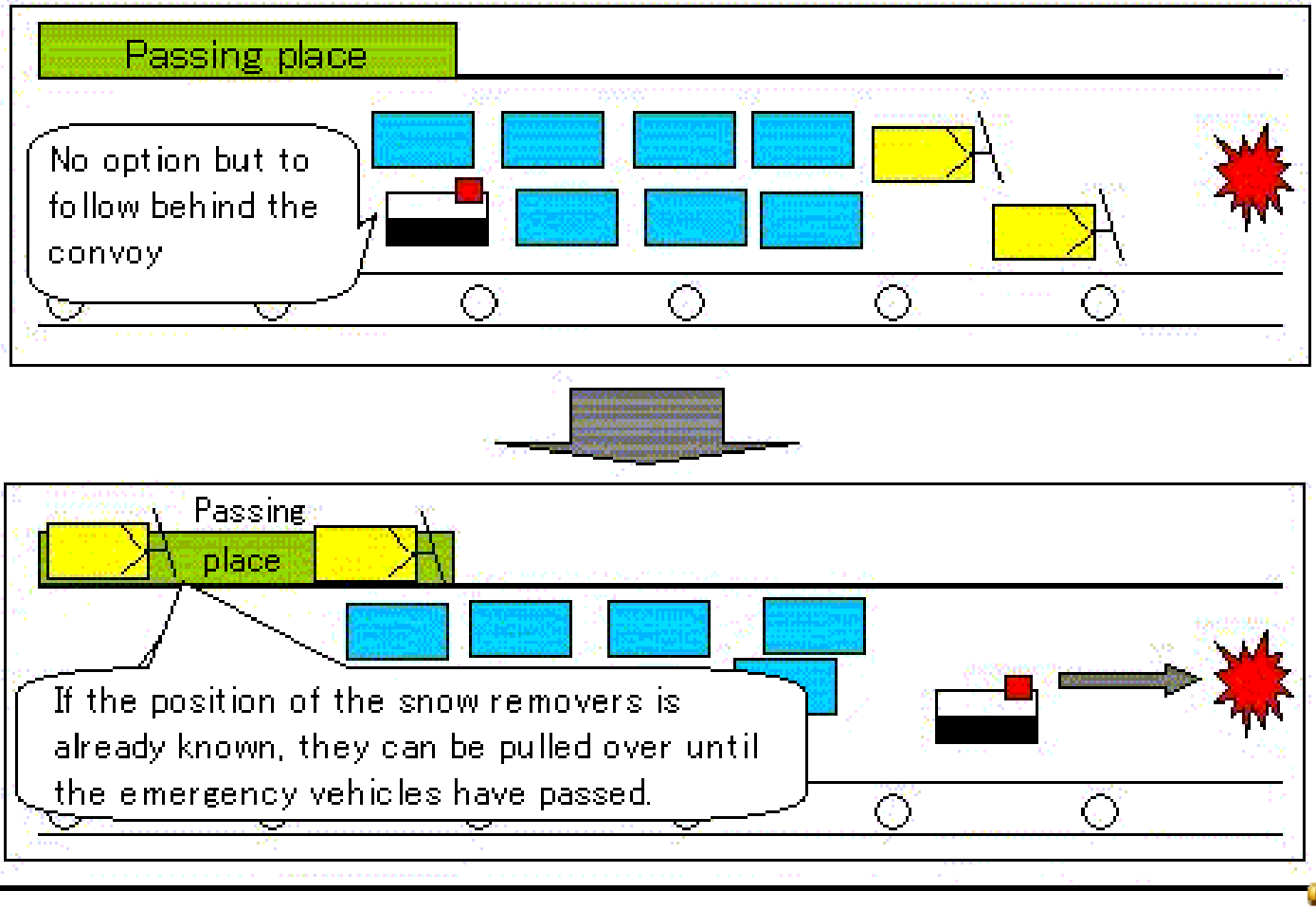
（AFTER）

◆ The System Assist Operator such as;

-Display of Each Vehicles Position on the Map

The Improvement of Crisis-Management

(2) There is an accident scene ahead of the snow removal convoy; directing the snow removal convoy to pull over in advance allows the patrol squad or police coming up from behind to move ahead (overtake) and arrive at the accident scene more quickly.



Pulling over for emergency vehicle

Conclusions

FOR MORE IMPROVEMENT,MORE EFFICIENCY

From now on,
To make improvements
To make the system easier to use
To conduct a quantitative assessment of
how labor-saving the system is.

Studies to expand the range of applications will continue.

Thank you for your attention.

m.yokota.ab@e-nexco.co.jp

END