Tests on ETC roadside equipment for Smart Interchanges for connection at Service/Parking Areas

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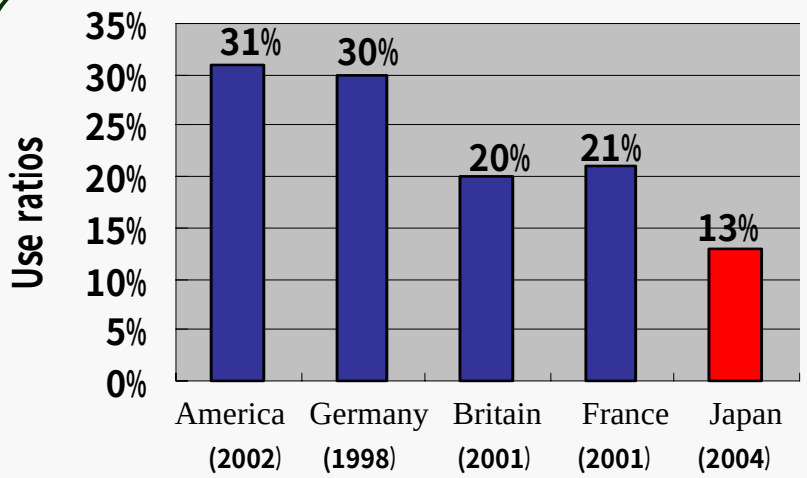
1. Current Status of Expressway operation (1)

The planned extension of Japanese expressways is 64% completed,

yet, the usage ratio is low compared to those of U.S. or Europe



Use ratios in each country

Situation of existing interchange in municipalities along expressways (January 1st, 2005)

Number of municipalities along expressways	869
Without access through an interchange in the above	325

Average interchange interval

Japan	approx. 10km
U.S. & Europe	approx.4-5km

A policy promoting 'usable' expressway is urged

- Addition of more interchanges should be addressed
- Flexible and diverse toll charge policy is required
- Prioritized construction of the missing road links

1. Current Status of Expressway operation (2)

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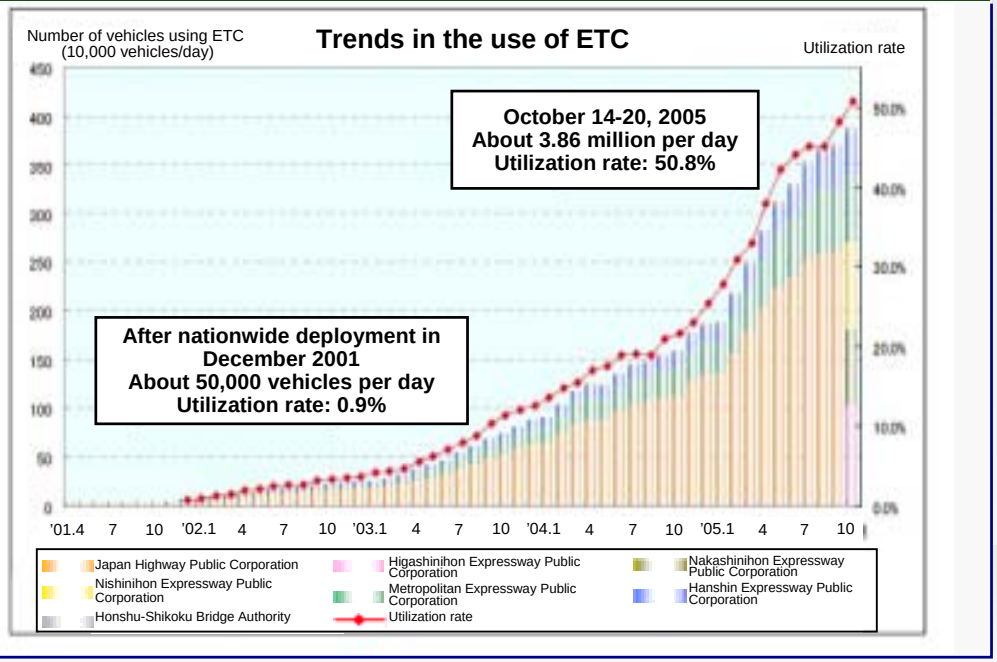
ETC → **commenced in March, 2001**

Aims: alleviate congestion, preserve roadside environment, save operation costs

As of September, 2005

Setup units 9 million, accounting for 50.8% of settlements

Pervasive ETC and use (as of Oct 25, 2005) source:ORSE

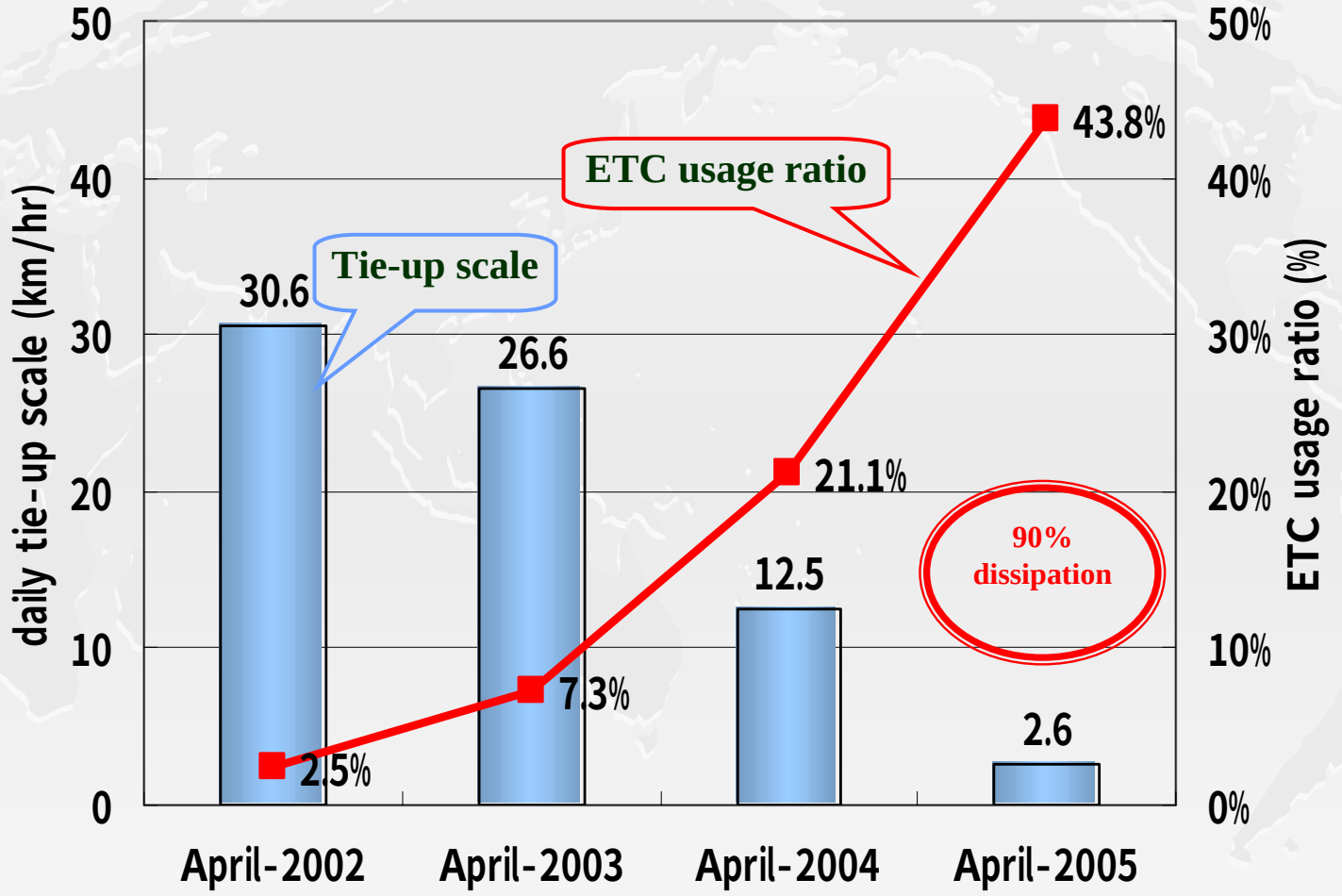


Various discount services

- ETC for commute・early/late hours discount (since Nov. 2004)
- ETC mileage discount service (since April, 2005)
- large/frequent transaction discount system (since April, 2005)
- others

1. Current Status of Expressway operation (2)

tollgate → recurring tie-ups → dissipation



Impact of ETC pervasiveness on tie-ups
(Metropolitan Expressways: 18 main lane tollgates)

2. Smart Interchange

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Impact of additional interchanges

- placement impacts

➢direct effectiveness of additions

results in 200 million JPY/year/location

Increase additional interchanges

Smart Interchange

・Interchange dedicated only to ETC vehicles

・costs savings realized for construction/maintenance/operation

- Cost reduction benefits

➢construction costs reduced by approx 30%
(trumpet-shape ⇒diamond shape)

➢operation costs reduced by approx 50%

Conceptual image of Smart Interchange

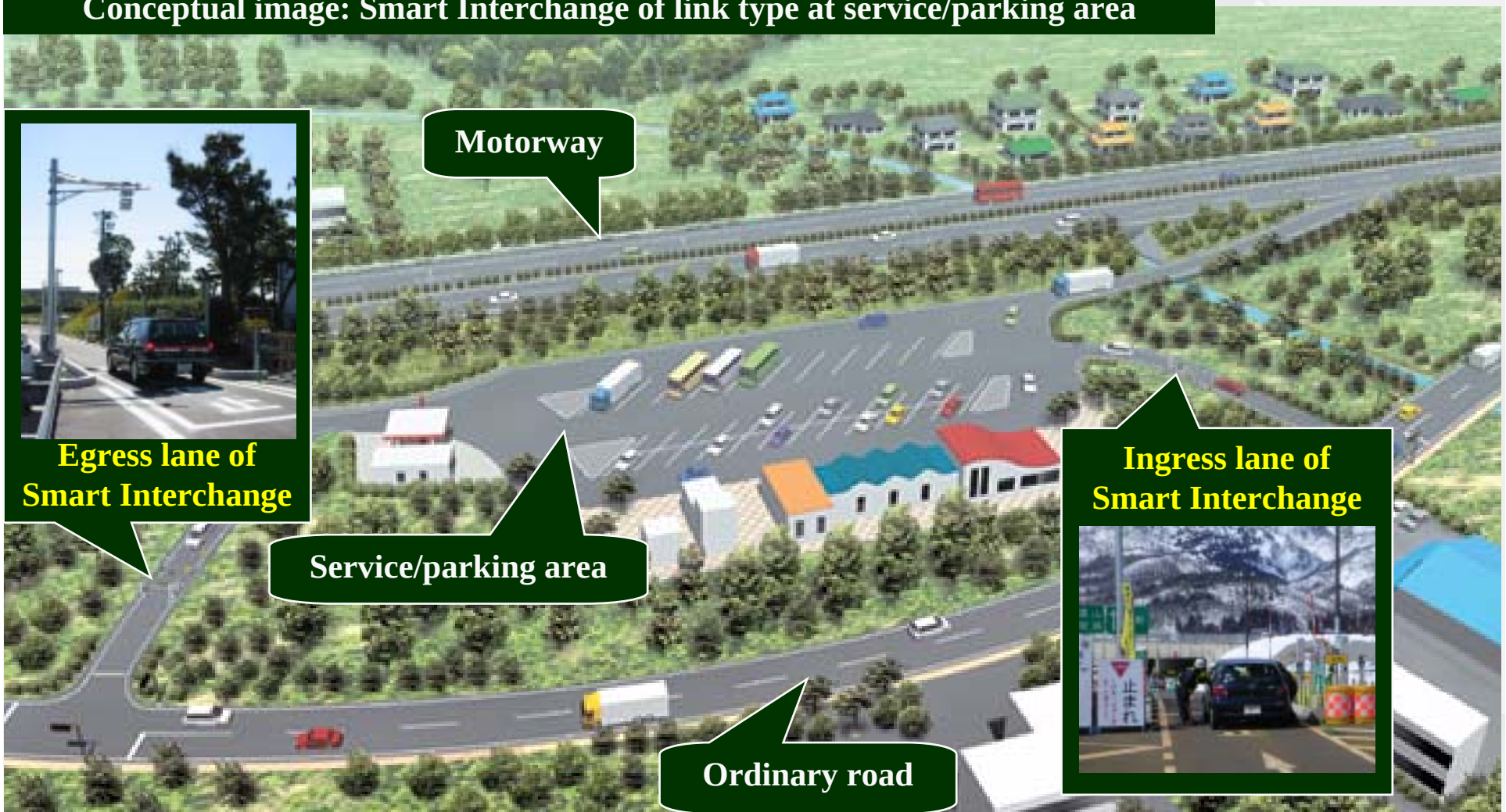
Current Interchange (trumpet- shape)

Smart Interchange (diamond-shape)

3. The Social Experiment of Smart Interchange (1)

Target: identify specification of system/device, device placement location and issues of operations

Conceptual image: Smart Interchange of link type at service/parking area



3. The Social Experiment of Smart Interchange (2)

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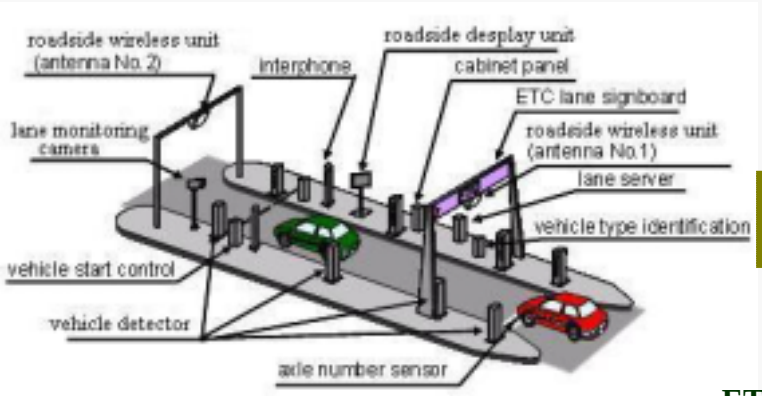
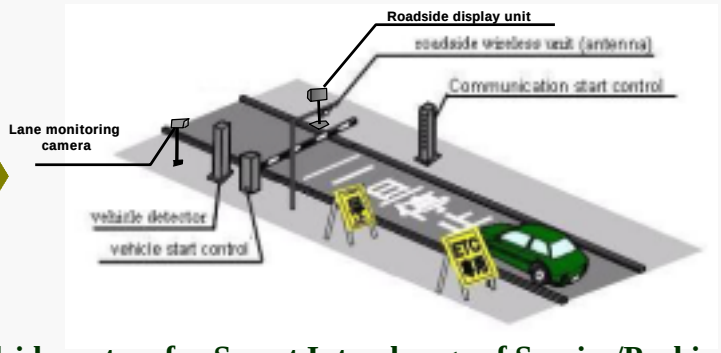
Comparison between ETC roadside system for the social experiment and existing ETC roadside system

Operation	Device	ETC roadside system for the social experiment	Current ETC roadside system
Restricted to particular vehicle	wireless roadside device	When restricting a tractor, single antenna at entrance method	Double-antenna method is employed
Dedicated for the vehicle with ETC OBE	ETC lane sign board	Fixed sign board	Movable sign board
For a vehicle halt	Vehicle start control	General purpose products (for a low price) are applicable（open/close operations in 3 seconds)	Dedicated device (open/close operation in 500ms)
	Vehicle detector	A single device is used without sensing axle load or reverse operations	4 sensors
A short term operation during Social Experiment	Tollgate server	Security processing section is composed of the current devices	Duplicated security procession



Existing ETC roadside system



ETC roadside system for Smart Interchange of Service/Parking area connection type as a social experiment

3. The Social Experiment of Smart Interchange (3)

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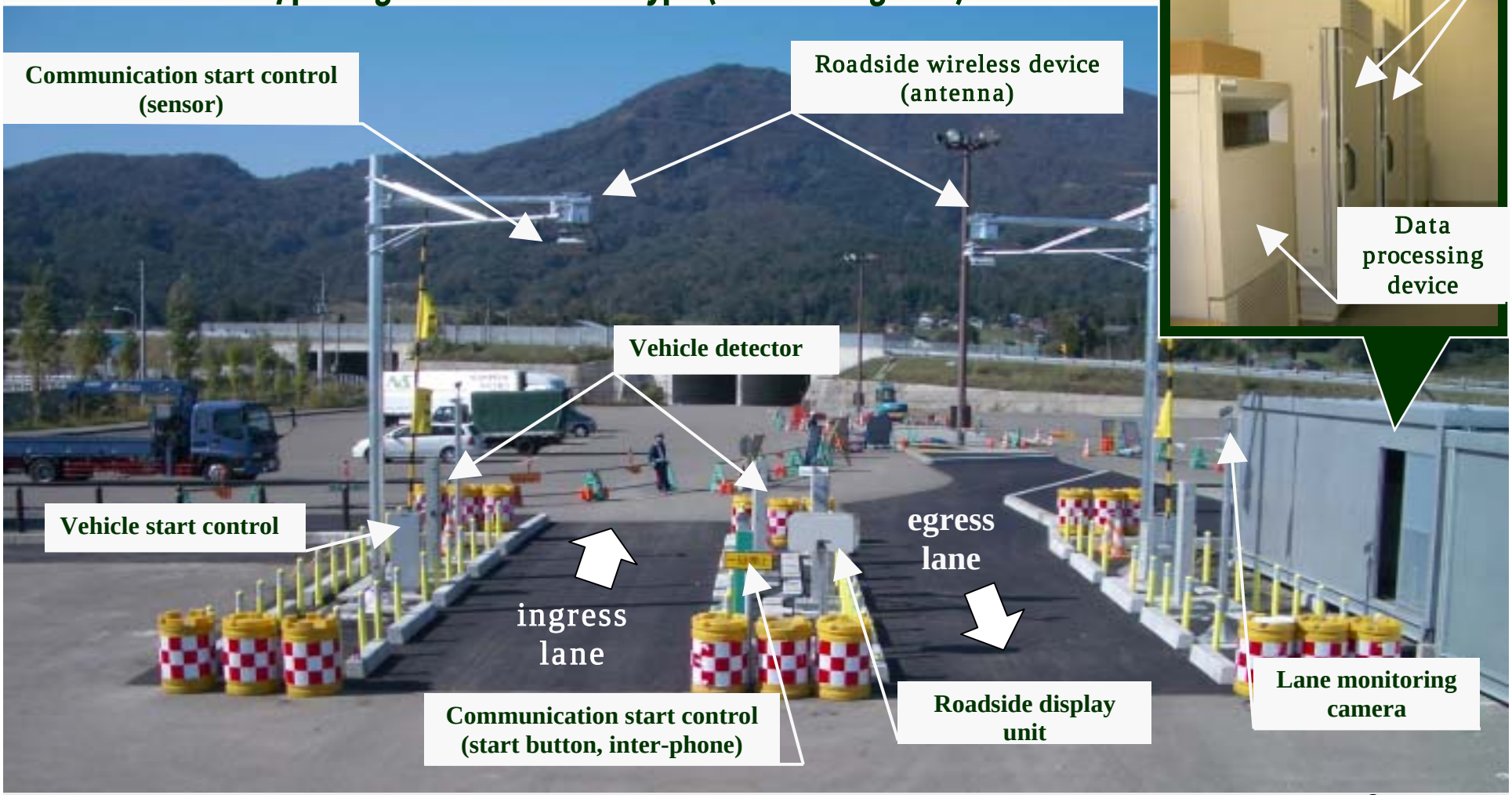
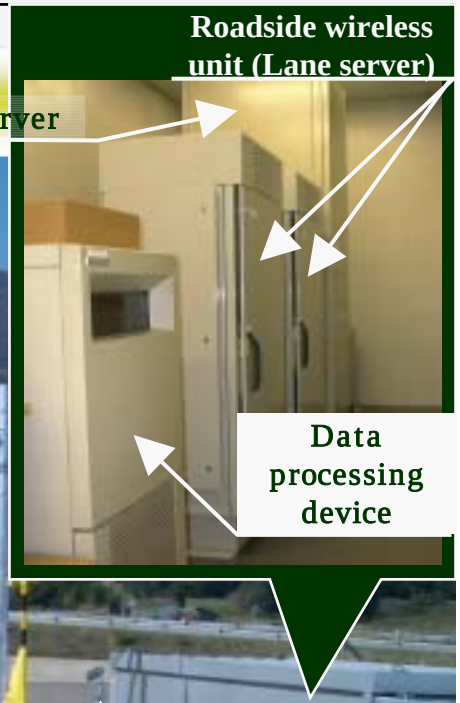
The Social Experiment of Smart Interchange of service/parking area connection type (Arai Parking area)





4. System Operation
Outcome Review (1)

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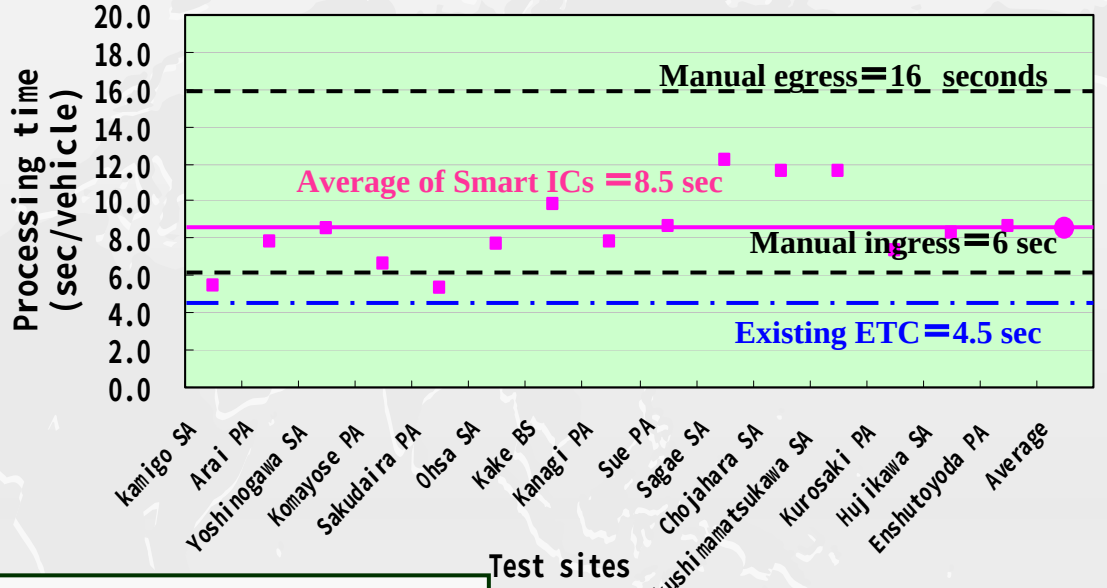
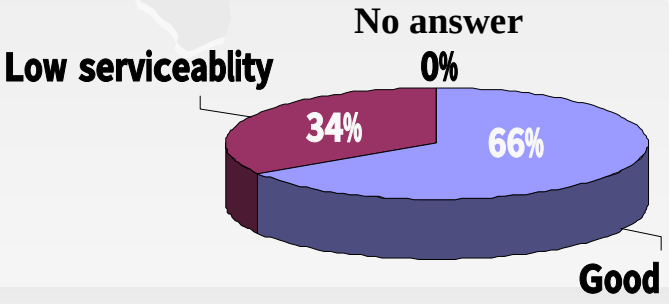
Required time to pass through gate section

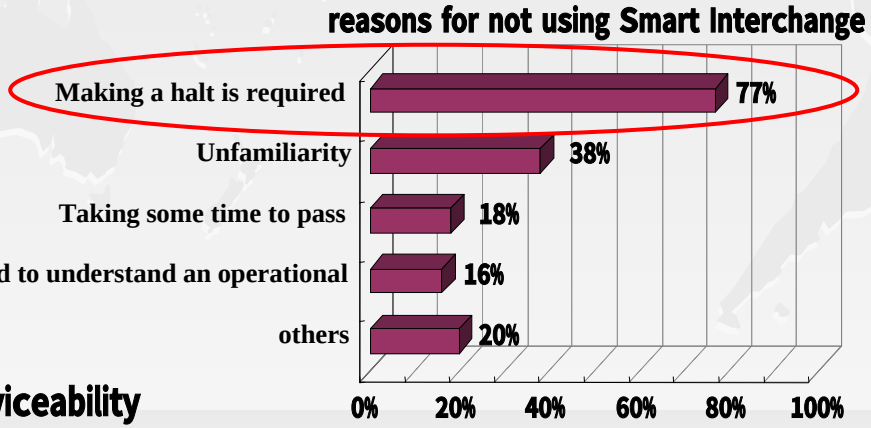
Outcome of system operations



Processing volume
Approx. 800 vehicle/hr (existing ETC)
Approx. 400 vehicle/h (Smart Interchange)
Approx.230 vehicle/hr (manual)

On a vehicle halt requirement in ETC service operation





Approx. 25%

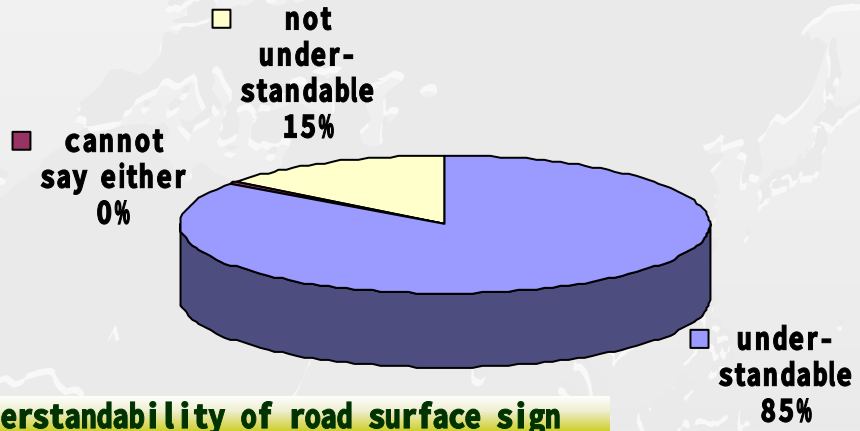
Serviceability of Smart Interchange

(Kamigo service area: 473 available replies out of 1400 distributed copies)

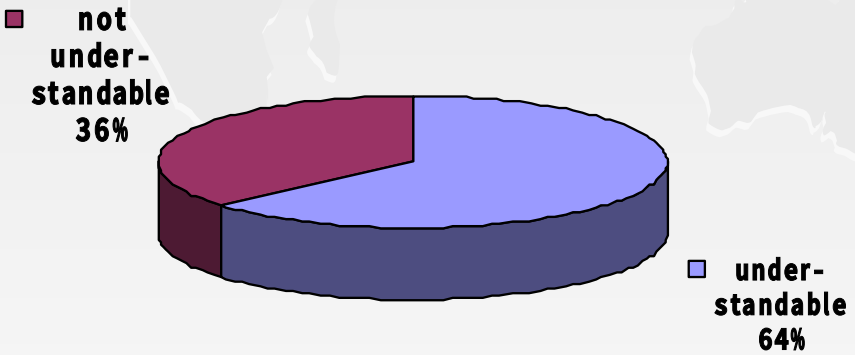
4. System Operation Evaluation Review (2)

User's performance evaluation

User's performance evaluation on device operations

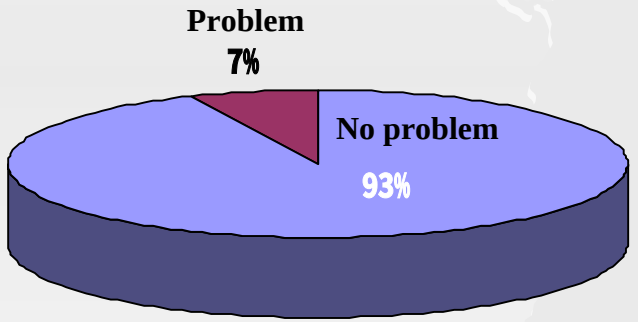


Understandability of road surface sign (available answer: 1,334)



Identification of button operation to start communications (available answer: 121)

User's remarks on Social Experiment of Smart Interchange



Problem indicated by users (available answer: 2,068)

4. System Operation Outcome Review (3)

Remarks of the users for a practical system use

Issue pointed out	cause	countermeasures
Low operation speed of Vehicle start control bar	A general purpose product is used	・Review of a gate passing time, etc. ・Device specifications are taken into consideration
Due to adverse weather (snowfall), poor visibility on signs of ingress/egress or a halt line	Low operation capacity of roadside display unit and low visibility of a halt line due to snow stuck	・snow melt capacity (snow melt heater) is prepared to cope with the site conditions
Operation time is not clear	User's unfamiliarity with operation time	・An additional display capacity and display unit ahead of the system is reviewed

5. Smart Interchange Operation in the Future

Issues:

- Enhancing safety
  - Secure a vehicle halt
- Smoother traffic flow guidance
  - Reliable vehicle guidance, plus reverse operation when a vehicle makes a wrong lane
- Total costs reduction
  - Review for reduction of monitoring efforts/costs

With review on operation conditions and device specifications, prepare for full-scale operation at further sites