Measures to Promote Inter-Operable Transport Smart Card Project

March 24, 2008

Excerpt from the Final Report by the Experts Committee on Transport Smart Card in Japan
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Development of the common transport smart card</td>
<td>2</td>
</tr>
<tr>
<td>inter-operable in several Asian economies</td>
<td></td>
</tr>
<tr>
<td>Method 1 : Multi Smart Card with memory partition technology</td>
<td>3</td>
</tr>
<tr>
<td>Method 2 : Multi Smart Card with selector software technology</td>
<td>4</td>
</tr>
<tr>
<td>Method 3 : Multi Smart Card with emulation technology</td>
<td>5</td>
</tr>
<tr>
<td>2. Process of the experiment and development of the common transport</td>
<td>6</td>
</tr>
<tr>
<td>smart card (in 2008)</td>
<td></td>
</tr>
<tr>
<td>3. Manufacturing process of the transport smart card for demonstration</td>
<td>7</td>
</tr>
<tr>
<td>test using selector software technology (Method 2)</td>
<td></td>
</tr>
<tr>
<td>Reference 1</td>
<td>8</td>
</tr>
<tr>
<td>Reference 2</td>
<td>9</td>
</tr>
</tbody>
</table>
1. Development of the common transport smart card inter-operable in several Asian economies

Developing technologies and experiments
3 methods of technologies and experiments are proposed.
(method 1) Multi Smart Card with memory partition technology
(method 2) Multi Smart Card with selector software technology
(method 3) Multi Smart Card with emulation technology

Concept of Asian common Smart Card (common to all the 3 methods)

Common transport smart card works as each economy’s card automatically by detecting radio wave of its ticket gate.

Common transport smart card in Asian economies

Inter-operable
Method 1: Multi Smart Card with memory partition technology

In this case, communication systems and OS are common.

(ex.) FeliCa Card in Japan, Hong Kong, Singapore and so on

A Realization Method
Communication interfaces and OS are common in different economies. And each city’s application and the data of smart card are recorded into “Method 1” cards separately by dividing memories. So these cards are inter-operable in several economies.
Method 2: Multi Smart Card with selector software technology

In this case, communication systems and OS are different.

(ex.)

<table>
<thead>
<tr>
<th>OS</th>
<th>Communication systems</th>
<th>Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>FeliCa OS</td>
<td>TypeC</td>
<td>Japan, Hong Kong and Singapore</td>
</tr>
<tr>
<td>JAVA OS</td>
<td>TypeB</td>
<td>Seoul</td>
</tr>
</tbody>
</table>

A Realization Method

The data, application and OS of transport smart card of several economies are loaded with one IC tip, and those are connected by selector software.
**Method 3 : Multi Smart Card with emulation technology**

This method can also be used in several economies whose OS and communication systems differ. (The same as Method 2)

**A Realization Method**

Applications of transport smart cards of several cities are loaded with one IC tip. And the difference of the OS is overcome by the emulator (like a universal OS) on the IC tip. (Each application works on the emulator.)
2. Process of the experiment and development of the common transport smart card (in 2008)

**Multi Smart Card with selector software technology <Method 2>**
*(or memory partition technology <Method 1>)*

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Stage</td>
<td>Make the smart card (ensuring the security of programs through measures which make programs un-analyzable and tamper-resistant)</td>
</tr>
<tr>
<td>2nd Stage</td>
<td>Install application programs of participating economies’ transport smart card into the smart card (trial from Korean application program)</td>
</tr>
<tr>
<td>3rd Stage</td>
<td>Experiment in the laboratory</td>
</tr>
<tr>
<td>4th Stage</td>
<td>Public experiment at some railway stations in Kansai area, Fukuoka area, etc.</td>
</tr>
</tbody>
</table>

**Multi Smart Card with emulation technology <Method 3>**

- Examination of the design and development of emulation program of each economy (from May)
- Examination of the design and development of whole program by uniting each program (from fall)
3. Manufacturing process of the transport smart card for demonstration test using selector software technology (Method 2)

- Install A city card’s program
- Procedure for issuance the smart card

- Conduct the demonstration test on card in order to examine their workability, such as performance in the laboratory

- Delivery to B city
  - The issuer company in A city sends the smart card to the other company in B city.

- Delivery to A city

- Install B city card’s program
- Procedure for issuance the smart card

- Conduct the demonstration test on card in order to examine their workability, such as performance in the laboratory
Overview of transport smart cards in Asia

(Reference 1)

Card Type: FeliCa

Card Type: Type A

Unit: thousand

India / New Delhi
- Delhi Metro Smart Card
  950 (card:450, token:500)

India / New Delhi
- Delhi Metro Smart Card
  1,050 (card:550, token:500)

Thailand / Bangkok
- Bangkok Metro Smart card
  450
- BTS SKY Smart Pass
  400

China / Shenzhen
- Shenzhen TransCard
  1,000

China / Beijing
- Yikatong card
  14,180

China / Shanghai
- Shanghai Public Transportation Card
  25,680

Korea / Seoul
- Upass 26,150
- T-Money 7,590

Korea / Busan
- Hanaro Card 6,750
- Mybi 6,940

Japan / Tokyo/Osaka
- Suica 23,110
- Pasmo 6,610
- ICOCA 3,370
- PiTaPa 1,130

India / New Delhi
- Delhi Metro Smart Card
  950 (card:450, token:500)

China / Hong Kong
- Octopus 14,000

Singapore / Singapore*
- EZ-Link 9,000

Type B card is introduced in Seoul and Singapore.
Overview of transport smart cards in Japan (Reference 2-1)

- **Kitaca**: JR Hokkaido Co.
- **ICCOA**: JR West
- **Suica**: JR East Co.
- **TOICA**: JR Central Co.
- **PASMO**: private railways and bus lines in Greater Tokyo
- **PiTaPa**: private railways and bus lines in Osaka, Kyoto, Kobe, etc.
- **Nimoca**: Nishi-Nippon Railroad Co.
- **SUGOCA**: JR Kyushu Co.
- **HAYAKAKEN**: Fukuoka City Subway Co.
- **Suica**: JR East Co.
Inter-operable transport smart cards in Japan

The two types of smart cards connected with this arrow are inter-operable.
One type of smart card connected with this arrow is solely operable in the other’s network.

- **Felica + Cybernetics Standard**
  - Prepaid card
  - “Post-pay” card

- **Kitaca**
  - JR Hokkaido Co.
  - Autumn 2008
  - Sapporo area

- **Suica**
  - JR East Co.
  - Greater Tokyo, Sendai area and Niigata area
  - 23.11 mil.

- **TOICA**
  - JR Central Co.
  - Nagoya and Shizuoka area
  - 3.37 mil.
  - 364 thousand

- **PASMO**
  - Private railways and bus lines in Greater Tokyo
  - 6.61 mil.

- **PASPY**
  - Hiroshima area
  - 1 Mar. 2008

- **ICOCA**
  - JR West Co.
  - Osaka, Kyoto, Kobe, etc.
  - and Hiroshima-Okayama area
  - 1 Aug. 2004
  - 3.37 mil.

- **PiTaPa**
  - Private railways and bus lines in Osaka, Kyoto, Kobe, etc.
  - 21 Jan. 2006
  - 1.13 mil.

- **SUGOCA**
  - JR Kyushu Co.
  - Spring 2009

- **HAYAKAKEN**
  - Fukuoka City Subway Co.
  - Spring 2009

- **nimoca**
  - Nishi-Nippon Railroad Co.
  - Fukuoka Kita-Kyushu area
  - 18 May 2008

- **PASMO**
  - Private railways and bus lines in Greater Tokyo
  - 6.61 mil.

- **Spring 2008**
  - Sapporo area

- **Spring 2010**
  - Nishi-Nippon Railroad Co.
  - Fukuoka Kita-Kyushu area

- **Reference 2-2**
  - 23.11 mil.
  - 6.61 mil.
  - 364 thousand
  - 1.13 mil.