SIP-adus Activities Report
Next Generation Transport

Cross-Ministerial Strategic Innovation Promotion Program
Innovation of Automated Driving for Universal Services

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For "Ensuring **safety** and **traffic jam reduction** on the road" ...

- Enhancement of **surface public transport (PT) function** for ensuring safety of vulnerable users (disabled & aged)
  - Increased level & quality of services of **PT**
  - ART: Advanced **Rapid** Transit ← BRT
    - automated pull-over control *
    - smooth & comfortable vehicle control *
    - priority service for public transit (PTPS)
    - seamless fare-payment, quick & safe boarding for wheel-chairs
    - integrated services with seamless & stress-free connections
    - universal information provision service including vulnerable users
- Showcase for **Olympic/Paralympic Games 2020 Tokyo**
  - travel demand concentration prediction; including congestion avoidance campaign
  - → to promote ART in other urban areas in Japan, and abroad !!

* Elements that make direct usage of automated driving technology

Next generation transport system: ART concept

Advanced PTPS(Public Transportation Priority System)
*Rapid and On-time operation

Advanced operation system with automated control systems
*Seamless and stress free connection

Automated acceleration control
*Smooth & Comfortable ride

Automated pull-over control
*Accessibility
*Short time and Safety boarding

Advanced Driver Assistance
*Traffic accidents prevention
*Driver burden reduction
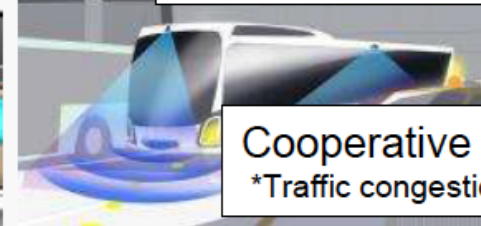
Cyber Agent

Universal built-in seats
Contactless electronic charging
*Cabin Safety and Convenience

Cooperative ACC
*Traffic congestion/CO_2 reduction

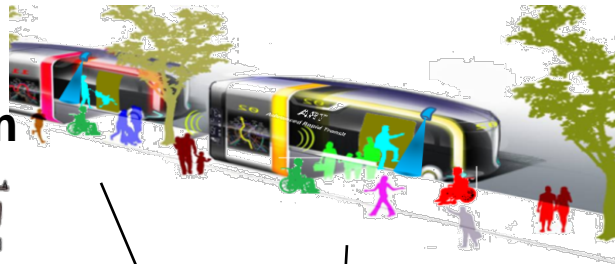# Next generation transport system: ART concept

Universal accessibility; especially for disabled and aged citizens

ART accessibility improvement
(Removal of obstacles / boarding/alighting quickness and safety)
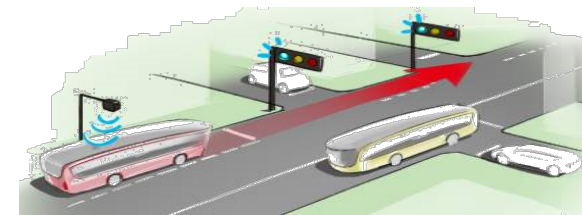
Pedestrian support system

public transport travel speed increase
(fast and stable operational service)

Advanced PICS
(Pedestrian Information
Communication System)

Automated pull-over control
Smooth & comfortable
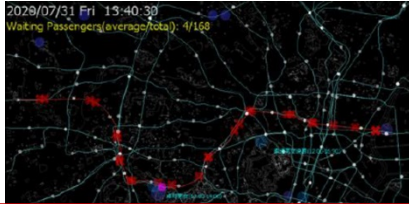vehicle control

Advanced PTPS

ART Information Center

System examples:
* Traffic congestion prediction by citizen participation
* Dynamic transfer information
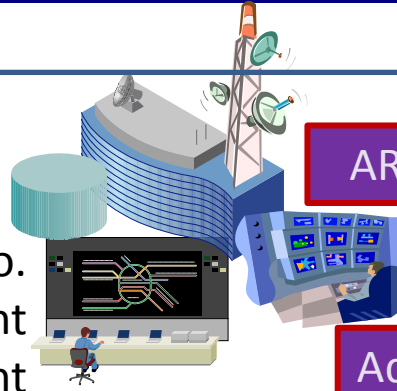* Remote diagnosis

Open platform for information related to ART

ART research and development field

ART Information System

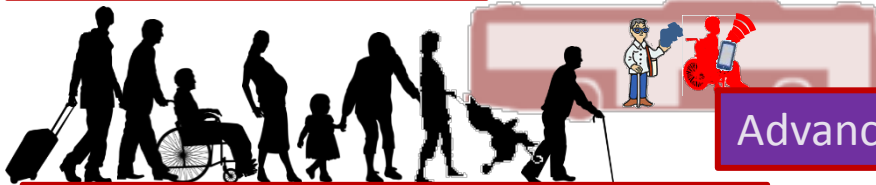2020/07/31 Fri 13:40:30
Waiting Passengers(average/total): 4/168

Central Info. management agent

ART Information center

Info. sharing w/bus location

Congestion Estimation

Advanced PTPS Infrastructure

Advanced PICS

Peds convenience & safety support

Rapidness establishment w/A-PTPS

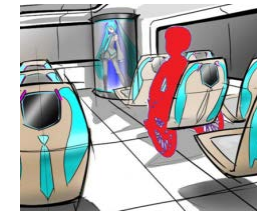## ART vehicle development

Digital signage
On board personal agent

Sensing & control for ART precise docking

Control & actuator for ART precise docking

Advanced PTPS on-board system

ART boarding service assistance

Automated accurate bus-stop parking control

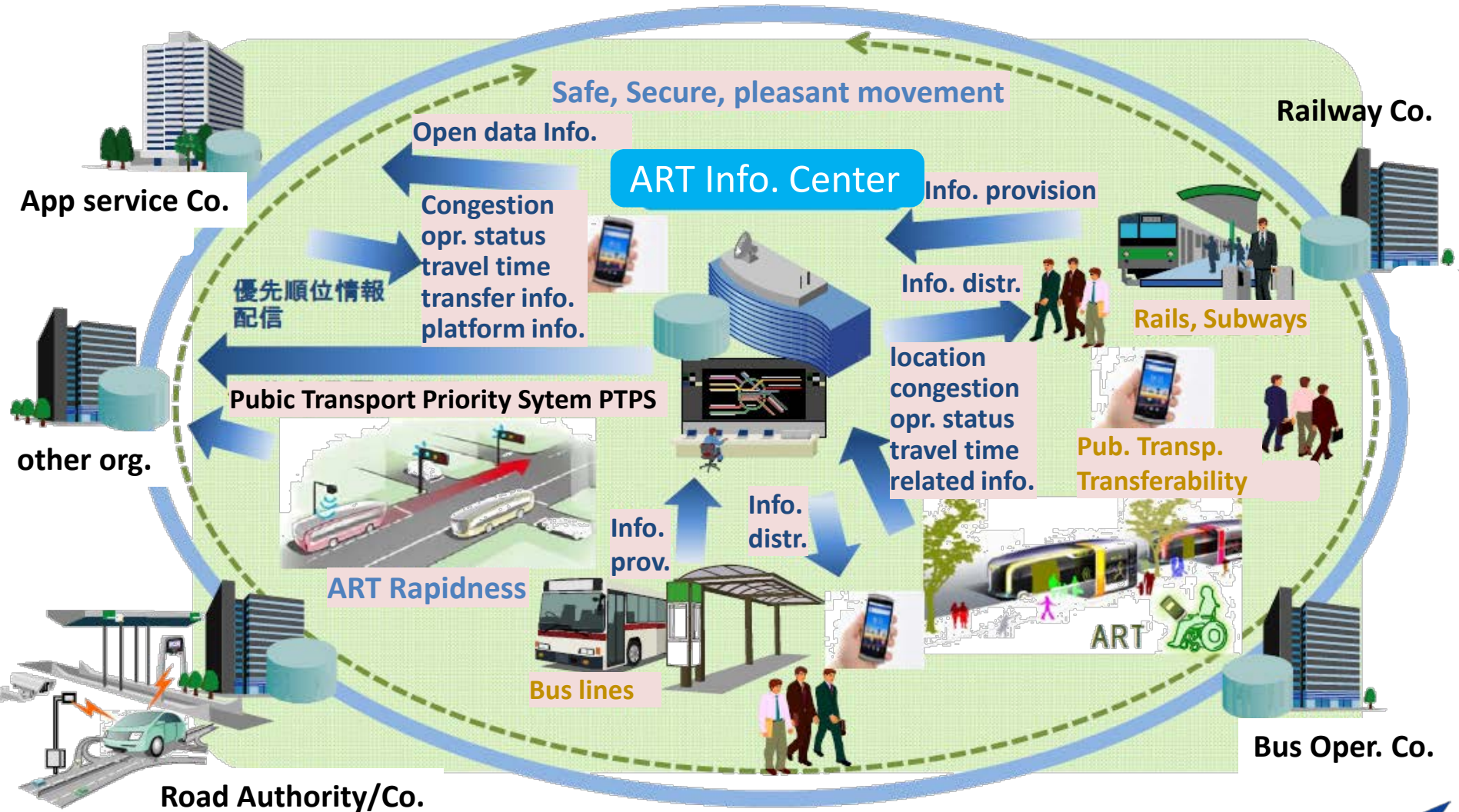Dangerous gap between bus & platform for wheel-chairs & blindness.

Docking technology to fill the Gap

ART Information Center

Core information for ART operation

ART Info. Center

Safe, Secure, pleasant movement

Open data Info.

Info. provision

Congestion opr. status travel time transfer info. platform info.

Info. distr.

location congestion opr. status travel time related info.

Pubic Transport Priority Sytem PTPS

優先順位情報配信

ART Rapidness

Info. prov.

Info. distr.

Bus lines

App service Co.

other org.

Road Authority/Co.

Railway Co.

Rails, Subways

Pub. Transp. Transferability

Bus Oper. Co.
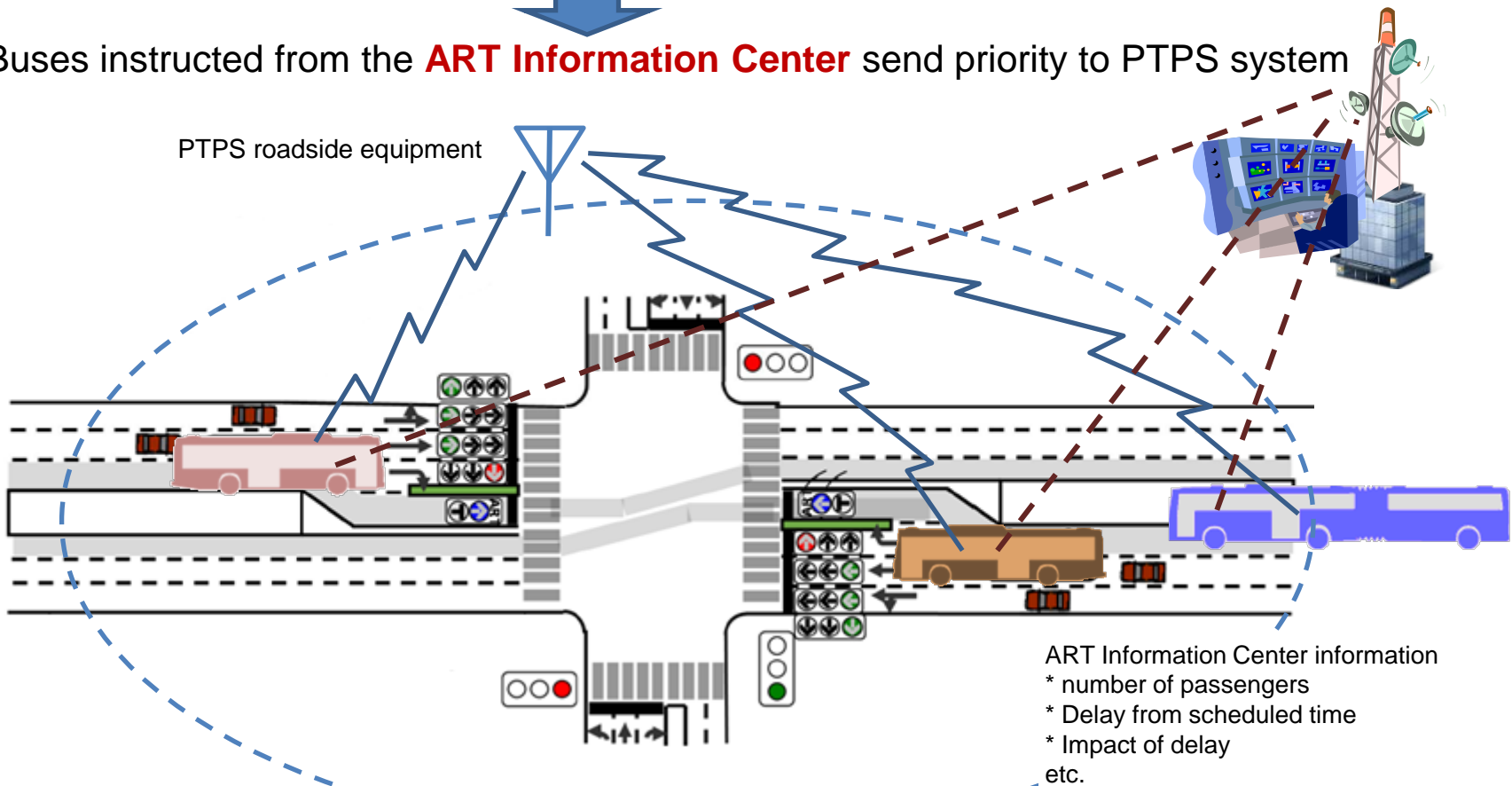
ART Information Center Concept

Enhanced PTPS that uses 700MHz band

ART Information Center Use Case 1

All buses: Request priority to pass a intersection at a certain distance from the intersection

ART Information Center: Rank priority and mediate priority requests

Buses instructed from the **ART Information Center** send priority to PTPS system

PTPS roadside equipment

ART Information Center information
* number of passengers
* Delay from scheduled time
* Impact of delay
etc.

PTPS scope based on 700MHz communication equipment

Transfer improvement

Dynamic transfer information

Arrival time predition
Historical data learning(deep learning)
+ present traffic congestion state

Connection information of riding bus and other modes
For overseas visitors, vision impaired passengers, etc.

Send information to individuals' smartphones
Smartphones to provide notification through automated translation or vibration

ART Information Center

Bus

Railway and subway

Bus location

Connection and transfers

Delay

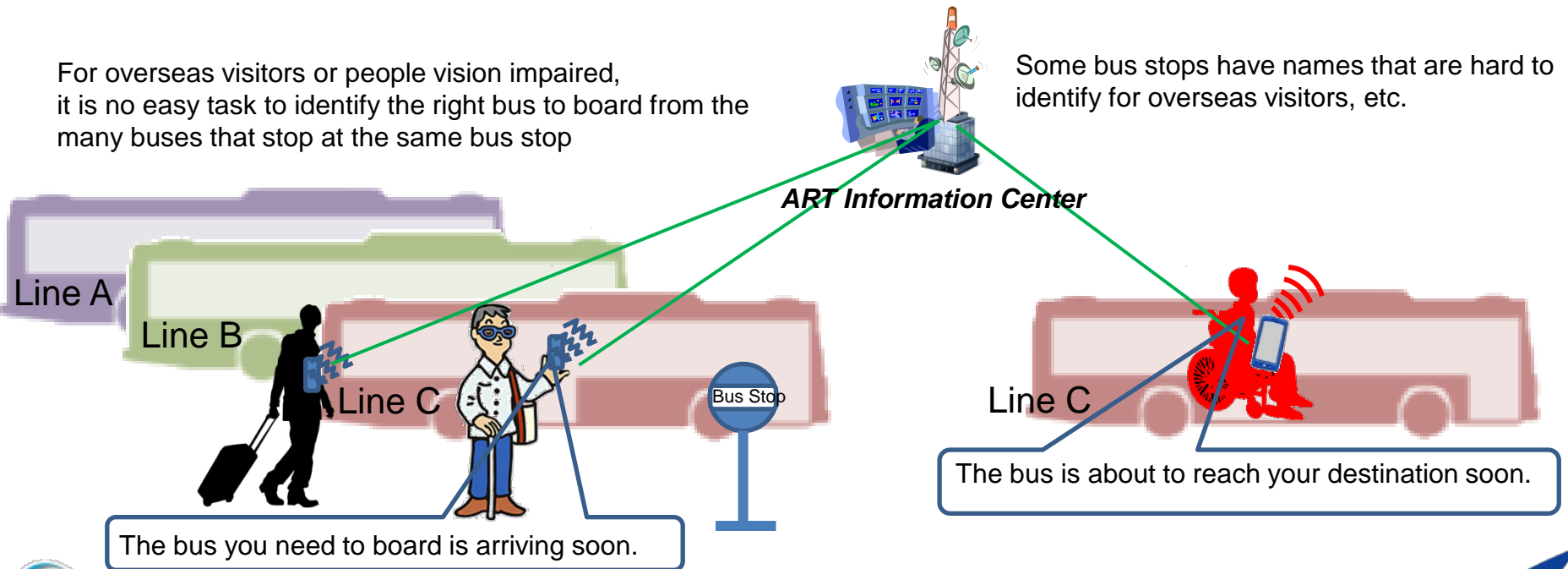scheduled operation

9
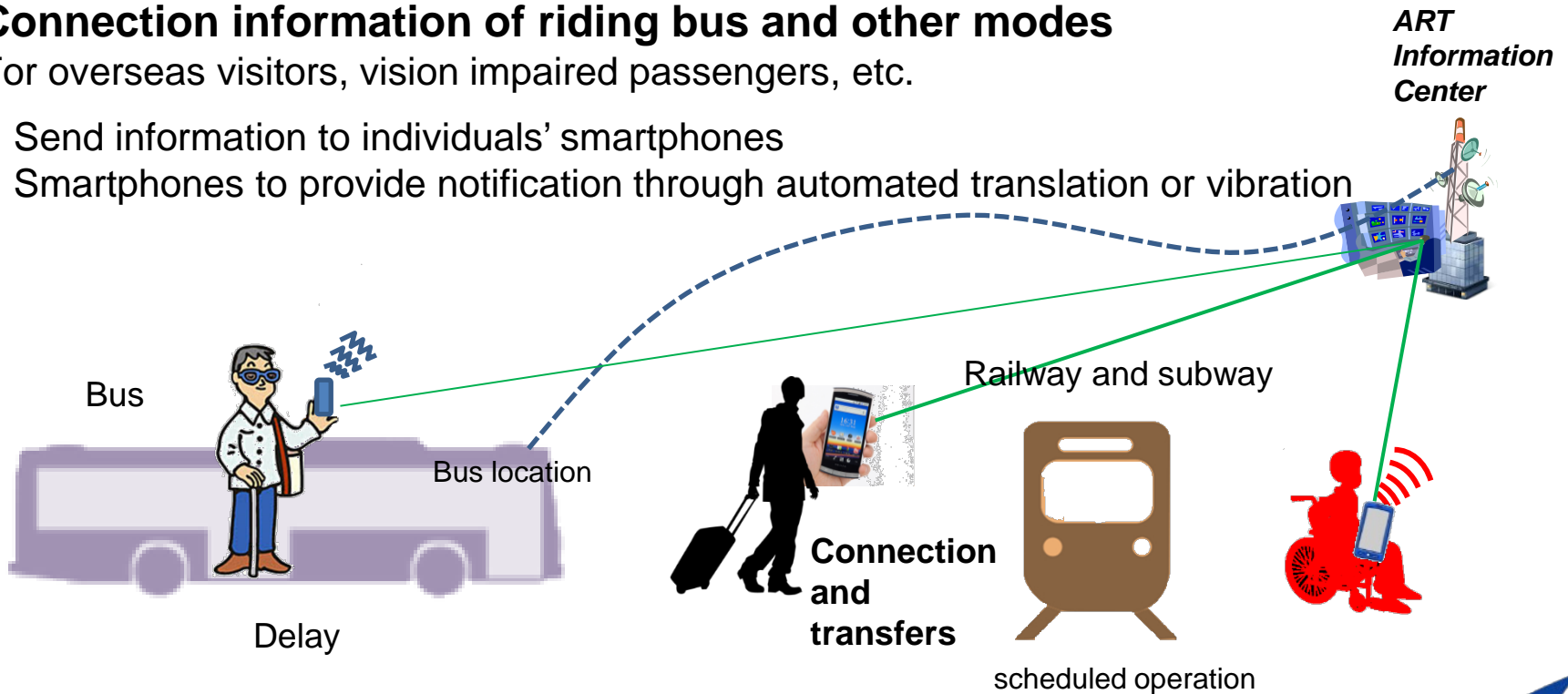
Bus usage information for individuals

Enter departure point, arrival point in the travel plan app (prior to start of travel)
The system functions that receive this input will:
1) Notify the intended bus arrival at the bus stop to the waiting passengers
   (ensuring the wrong bus is not boarded by mistake)
2) Notify the alighting destination bus stop to the passengers on board
   (ensuring passengers do not forget to exit)
3) Send notices to smartphones translated into mother tongue by an installed app

For overseas visitors or people vision impaired,
it is no easy task to identify the right bus to board from the
many buses that stop at the same bus stop

Some bus stops have names that are hard to
identify for overseas visitors, etc.

ART Information Center

Line A

Line B

Line C

Bus Stop

Line C

The bus is about to reach your destination soon.

The bus you need to board is arriving soon.

Okinawa field operational test

<u>Press release issued on December 26, 2016</u>
The field operational test of automated driving bus in Okinawa in March 2017

Okinawa

Automated driving introduction in small buses

Surface street

Vicinity of Azama Sun-Sun Beach, Nanjo City, Okinawa Prefecture

Significance of introduction in Okinawa

Many transport issues in Okinawa

Traffic congestion: travel speed in the peak hour: 16 km/h

Society reliant on private cars: Public transport share: 3.2%

Rapid expansion in tourists: Tourism revenue up 1.5x between 2012 to 2015

Societal aging: Percentage of people age 65 and over to reach 22.9% in 2020

Various needs (example)
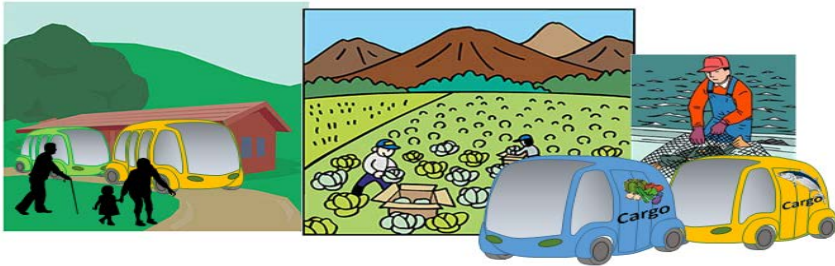
Transport support business model for depopulated areas

Short-distance public transport that can be boarded even with wet swimwear

People drive to beach by car but wish to consume alcohol