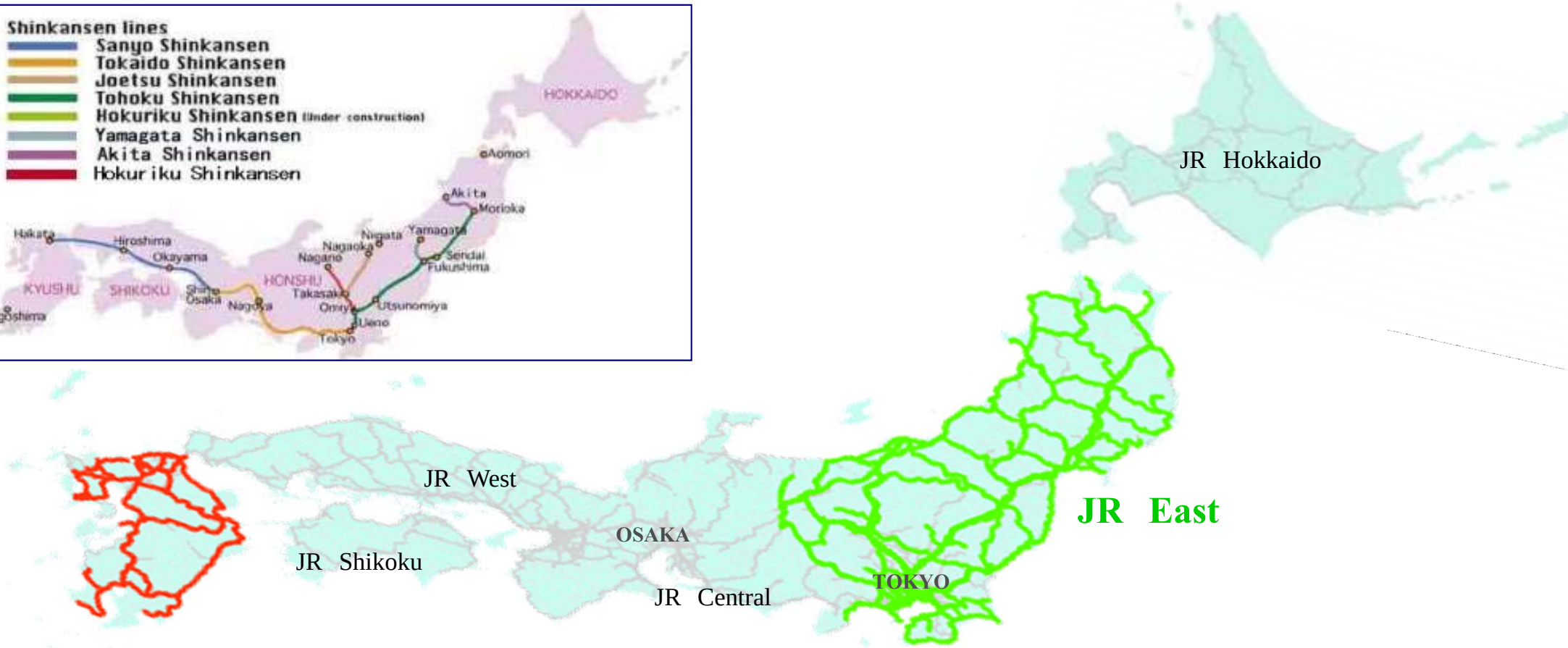
RailwayGIS

JR EAST Consultants Co., Ltd.
ICT Business Division
Mitsuaki Kobayashi

Summary of Passenger Railway Network in JAPAN



Passenger Railway Companies	Passenger Line Lengths (km)	Number of Stations
JR East	7,526	1,699
JR Kyushu	2,121	556
Others (combined)	10,357	2,342

Introduction

- **The life cycles of the various drawings used in the railway operation are digitized nowadays within individual work processes, but there still is a need for paper when they are to be interchanged between the processes.**
- **The greatest problem in improving this situation has been in the area of the large-scale " Alignment Plan".**

- **We at JR East and JR Kyusyu have successfully introduced "Railway GIS System", which is a railway space information system utilizing the GIS technology, to realize a seamless data flow that begins and ends with digitalized information eradicating all paper media.**

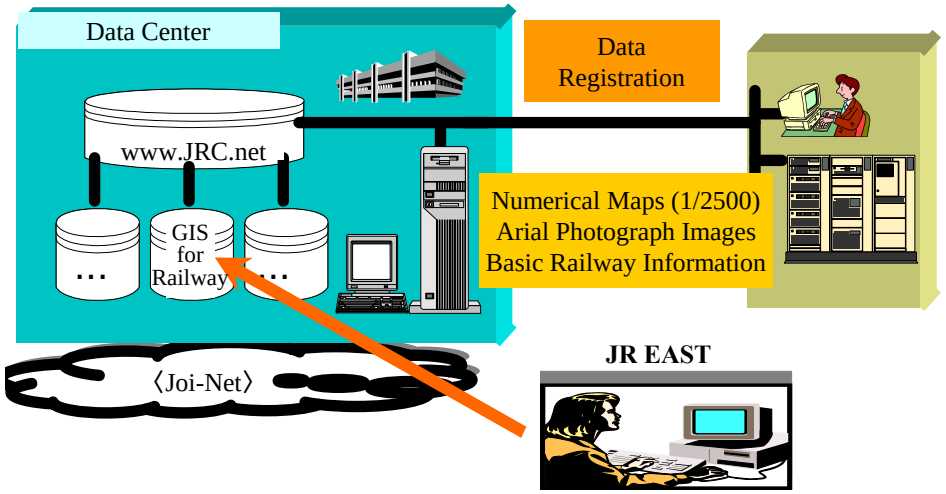
- **By the use of this system, it is intended to put into the data form all of the work processes needed to realize information sharing through integration of the drawing management data base and the maintenance and assets ledger management data base, thereby contributing to the improvement of the productivity over the entire scope of the company operation.**

Railway Space Information Management System
(Railway GIS)

Constructed with the orthophoto image data, the digital map data of a 1/2500 reduced scale and the basic railway information, this system serves for the management, updating and distribution of such information through the communication network.

The "Railway GIS" was constructed by timely and low cost acquisition of such information as aerial photographs and alignment plans which had been produced for various railway projects and disaster control purposes as needed.

Image of Services Provided



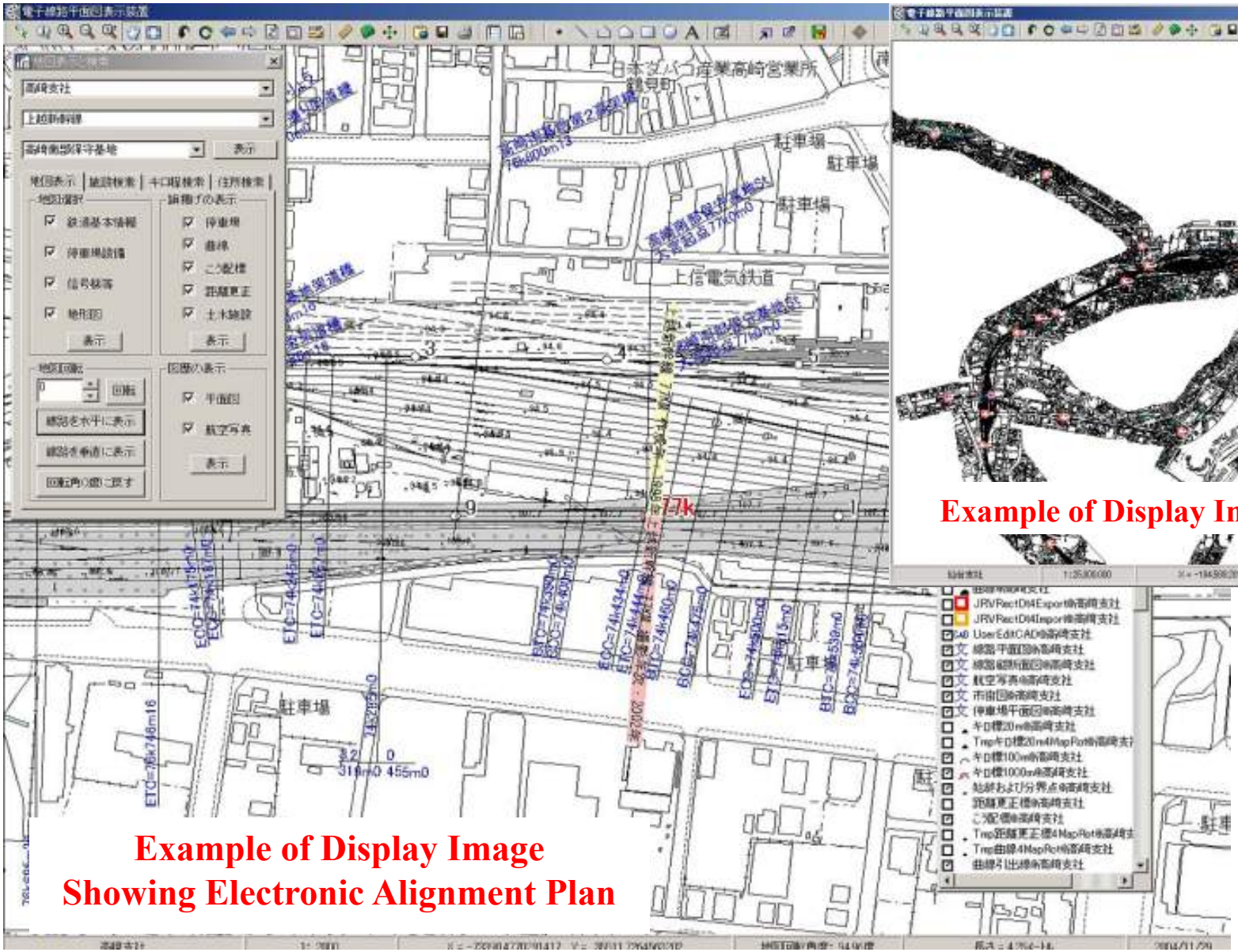
By this approach, a large cost reduction was realized compared with making alignment plans afresh, while enabling sharing of updated and coordinated information, resulting in work efficiency improvement.

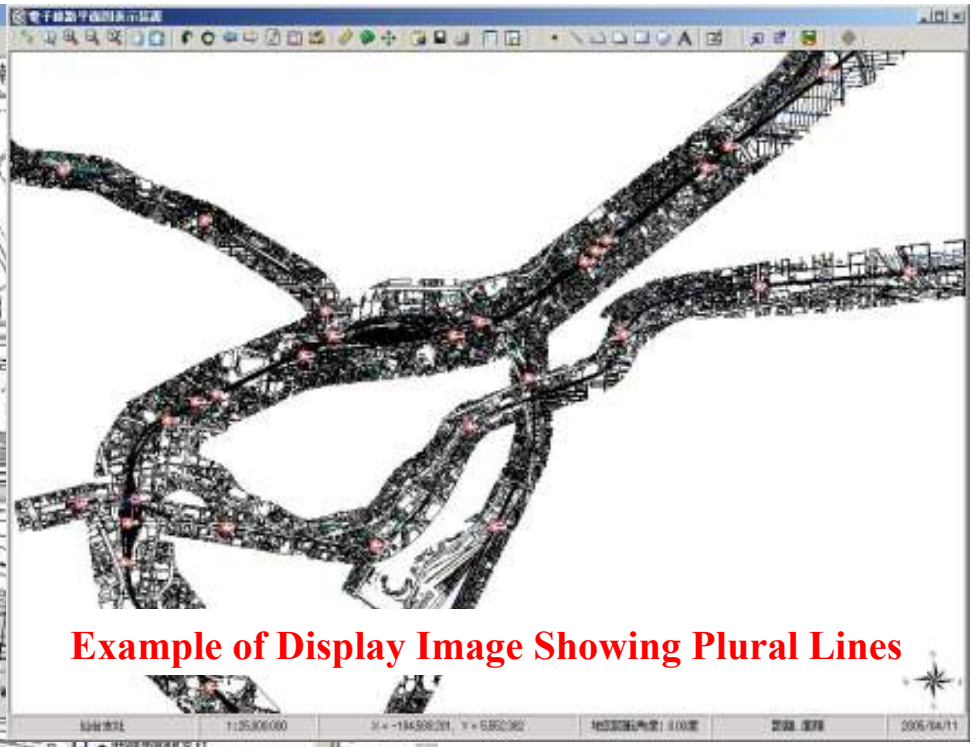
Initial Display

Display for Image Selection

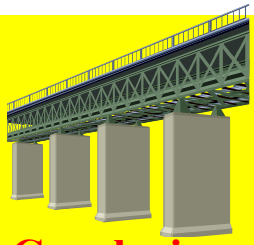
Display for Processing

Specifications for Digitalization of Electronic Maps Including Alignment Plans, Etc.





Flow of Digital Information Life Cycle



Conclusion of Construction Work

Facilities in Operation

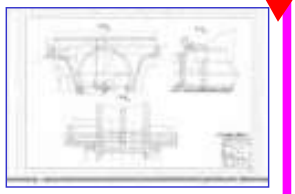
Inspection of Structures

New Installation
→Registration
Removal
→Deletion

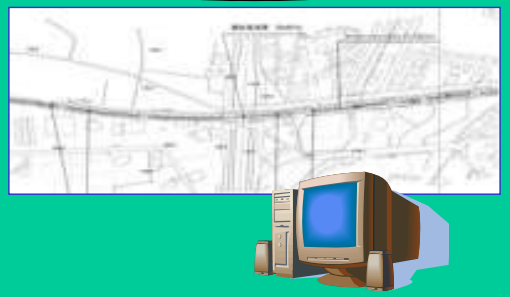
Assets Consolidation

Location Plans

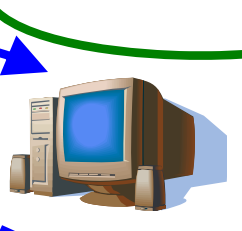
Assets Drawings



Electronic Maps



Inspection Data Verification

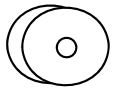


Maintenance Ledger Data Base

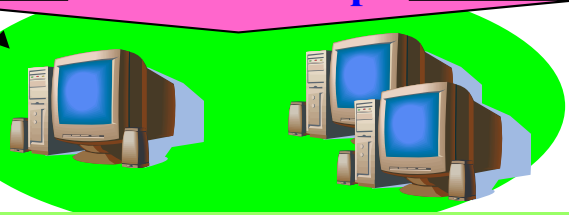
Facilities Management System

Correction of Electronic Maps

Data Retrieval



CD-R

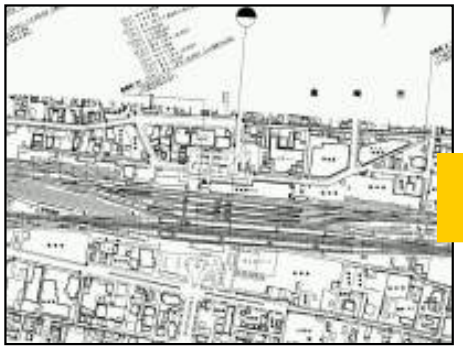


Drawing Management Equipment at Each Branch Office

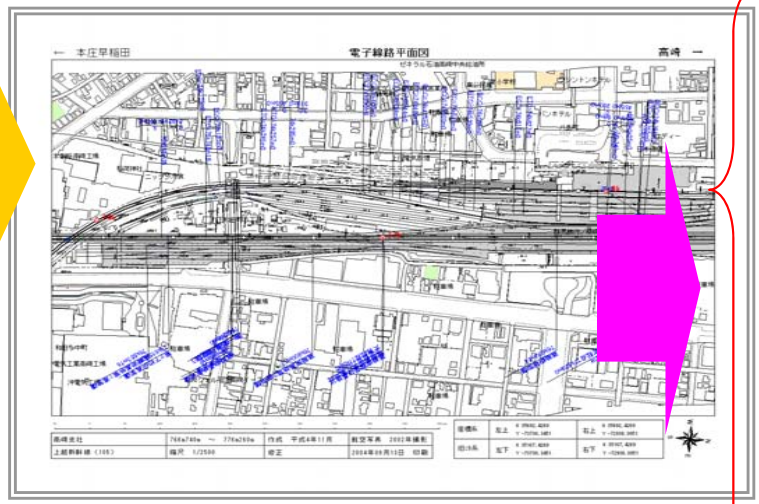
Verification of Ledger Data

Improvement of Space Management by Means of Railway GIS

-Improvement of Railway Space Information Management by GIS Technologies-

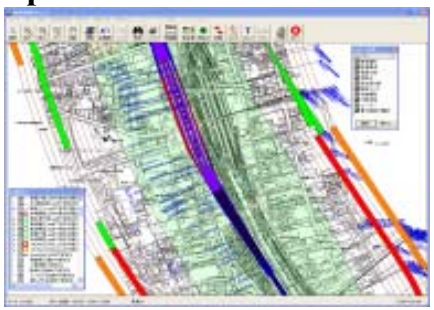


Alignment Plans, Plans and Longitudinal Section Drawings of Stations (Analog)
7470km 1695 stations
No. of drawings: 4853



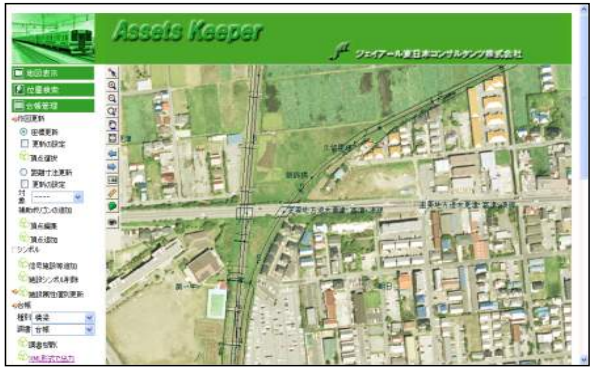
Electronic Alignment Plan (Digital)

- Application to Civil and Structural Assets
- Application to Next-generation MARS
- Application to Chuetsu Earthquake Hazard Maps
- Application to Construction Division's Data Base
- ・・
- Application to Noise Maps
- Other Purposes



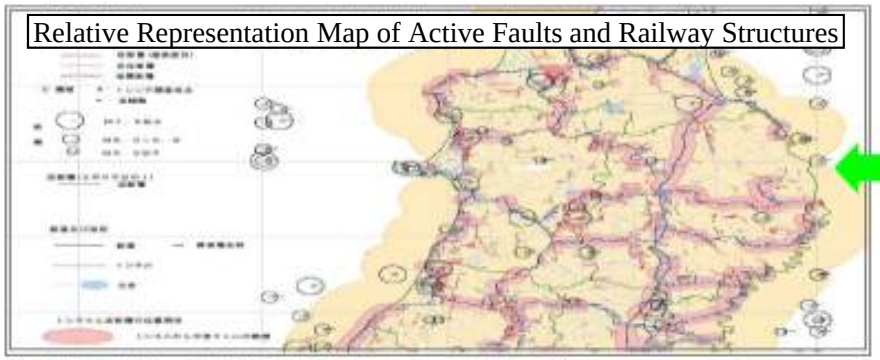
Commencement of Work at JR Kyushu for all of its routes

Application to "Assets Keeper" (the assets management system designed for semipublic railway operators and small to medium size private railway companies)

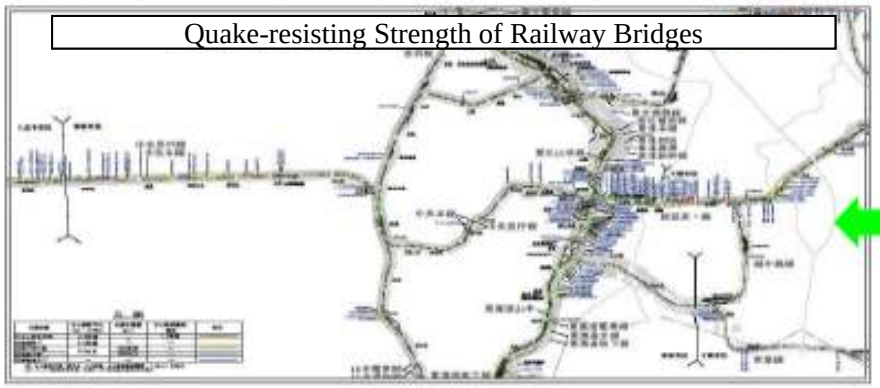


Application to Individual Operation Areas

Relative Representation Map of Active Faults and Railway Structures



Quake-resisting Strength of Railway Bridges

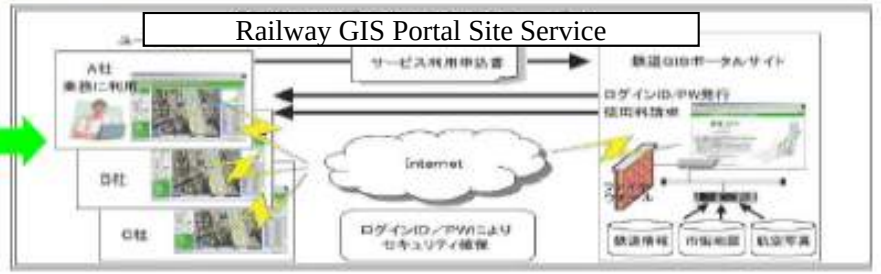


Development and Integration

System for Managing Spaces under Elevated Trucks

Fixed Asset Information System

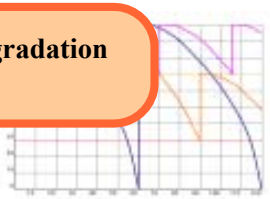
Railway GIS Portal Site Service



- **Railway GIS Makes It Possible to Produce Accurate Documents in Short Time And with**
- **Full Utilization of All Available Resources**

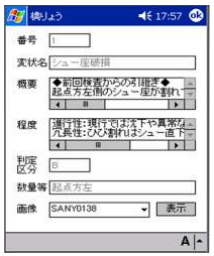
Profile of “Assets Keeper”

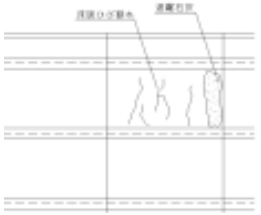
Preestimation of Degradation
Maintenance Plan



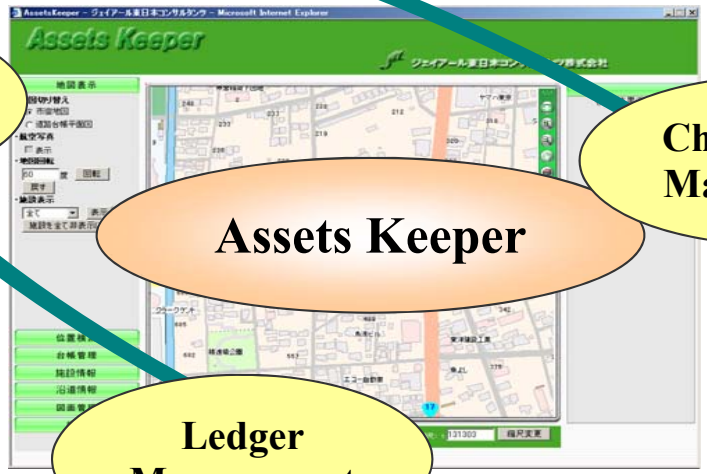
Repair Work Ledgers
Construction Work
Records
Damage Photos

Assessment of
Health Level





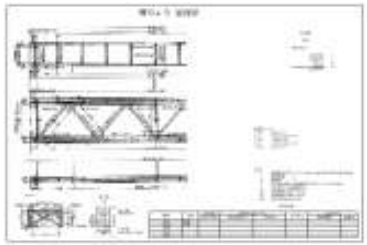
Repair
History



Checkout for
Maintenance

On-site Checkout with PDA
Collation with Past Checkout Data
Registration of New Data on Data Base

Assets Keeper

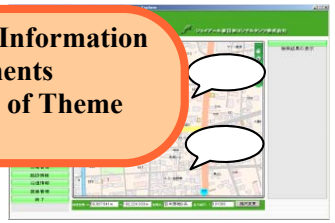


Ledger
Management

Routine
Work

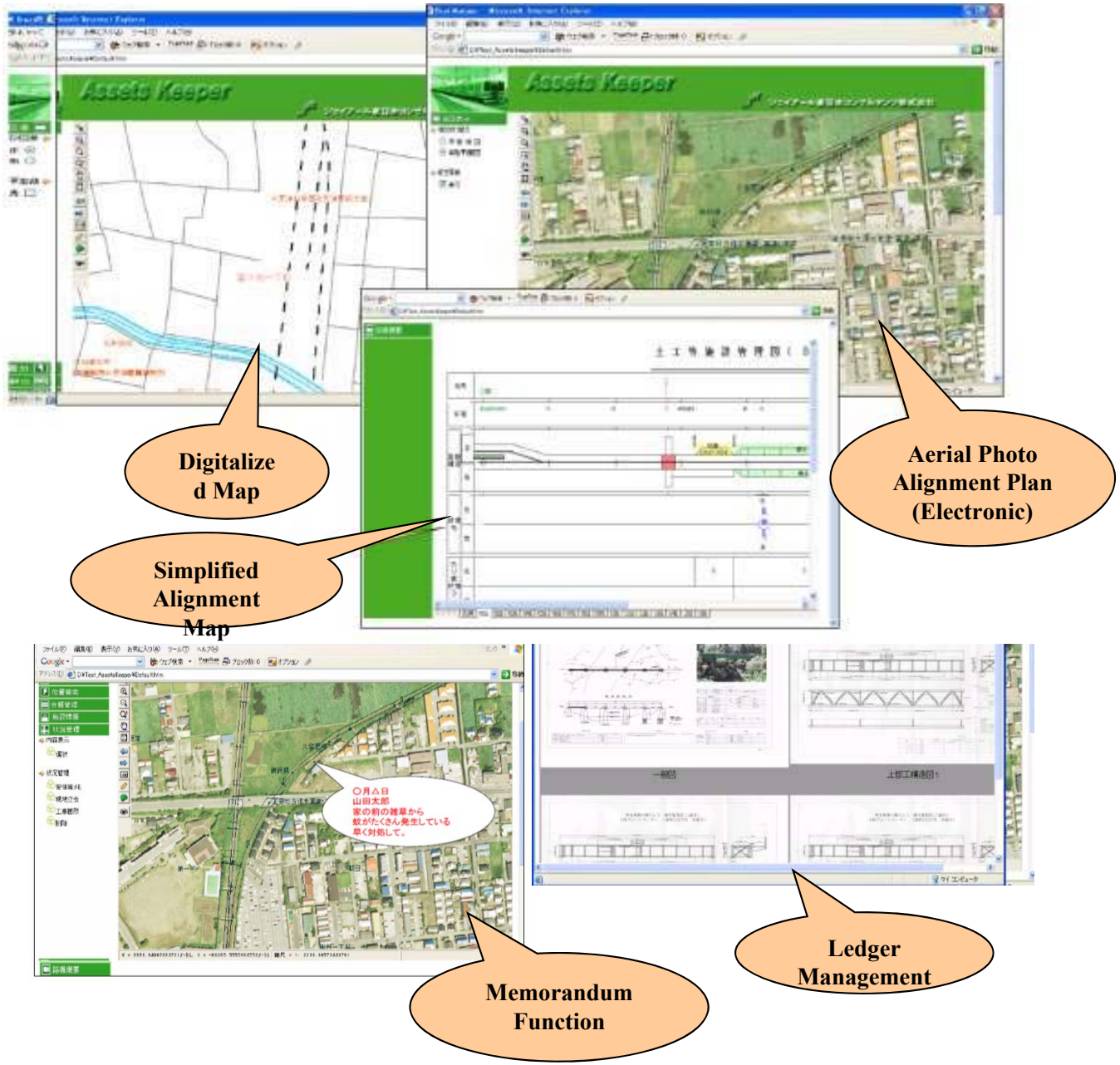
Road Ledgers, Plans
Actual Distance Reports
Bridge Status Reports
Checkout Reports
Design Documents

Sharing of Information
and Documents
Production of Theme
Drawings



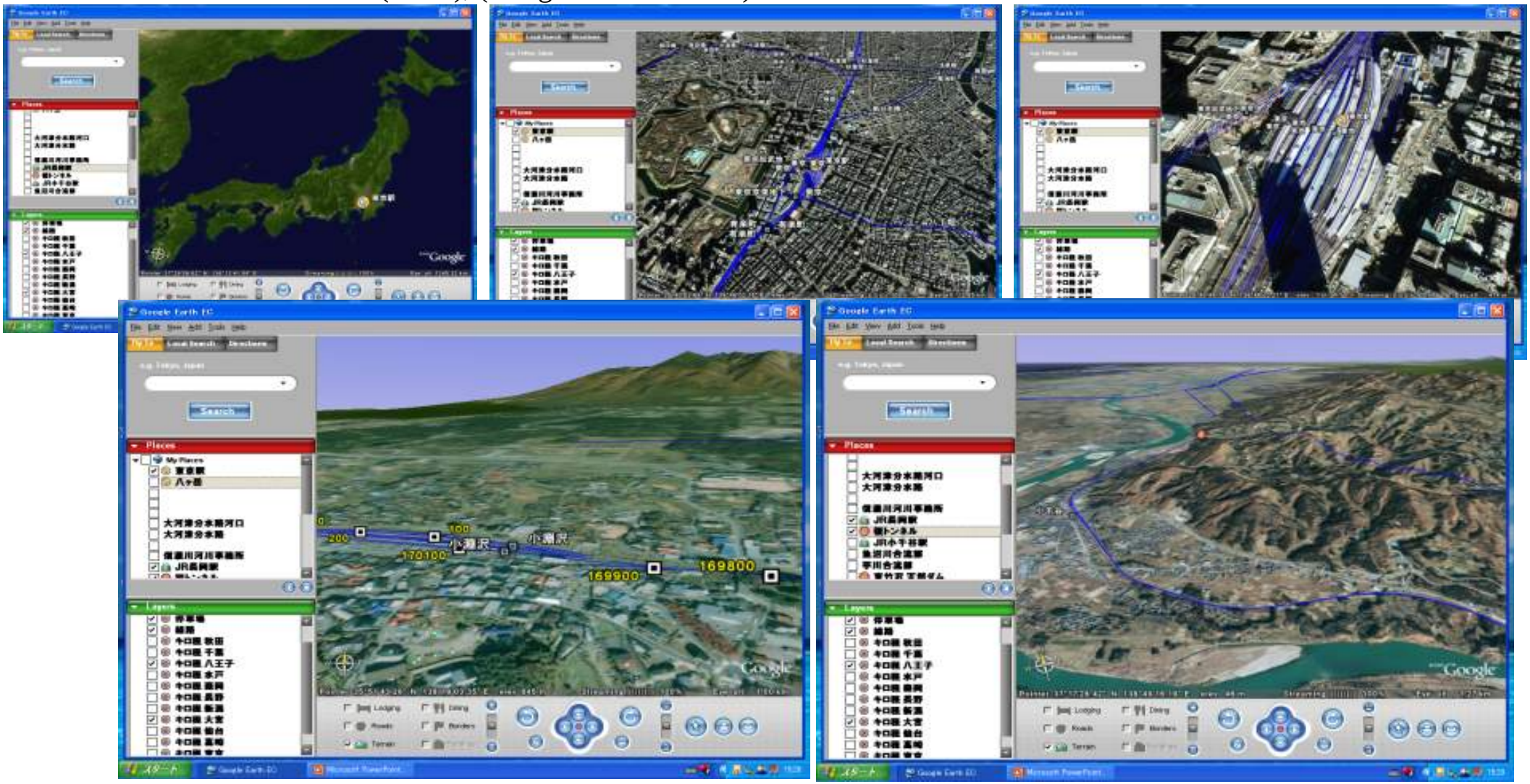
Function of “Assets Keeper”

- **Display Functions**
  - Displays degradation level of the facilities on the geographical map, on a year-by-year basis
  - Overlapped display of the aerial photo and the alignment plan
- **Retrieval Function**
  - Retrieves the map from the address or kilometerage
  - Displays the ledger from the icon of the facilities
- **Interaction with Site Inspection Information Terminal (PDA)**
  - Registration of checkout plans and records
- **Ledger Management Function**
  - Ledger display editing by year and by structure
  - Registration of checkout photos
  - Registration of checkout plans and reports
  - Display of checkout report lists
- **Memorandum Function**
  - Complaint messages related to track work, etc. can be noted down.



Satellite Image Distribution Service
「Google Earth &Railway」

Service to Distribute to Railway Operators, etc. Images Taken by Satellite (covering whole Japanese Territory at 15m Resolution and Major Cites and Trackside Areas at 1m Resolution), overlapped with 3-dimension Models (DTM), (Google-Earth Version).



Google Earth &Railway

“Google Earth &Railway” displays high-resolution satellite photos, three-dimensional terrain date and map information on the Google Earth※ system in Japan. It can also zoom in, zoom out and show bird’s eye views of super imposed route maps and rail facilities.

※Google Earth is provided by Google Inc.

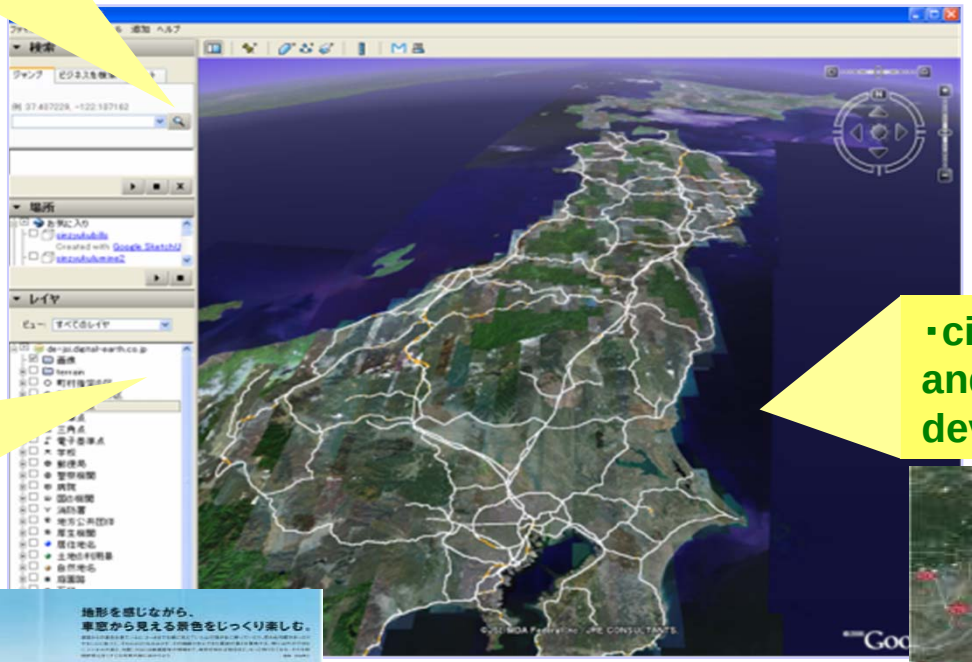
・disaster prevention plan, drawings and maintenance management

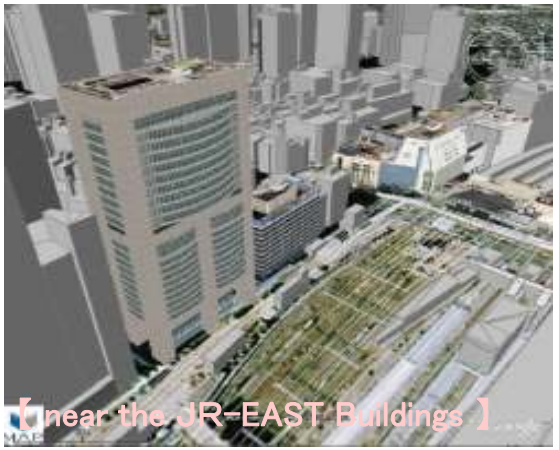
【 rail plan view 】

・tourism, travel business

【 travel brochures 】

【JR-EAST Area】





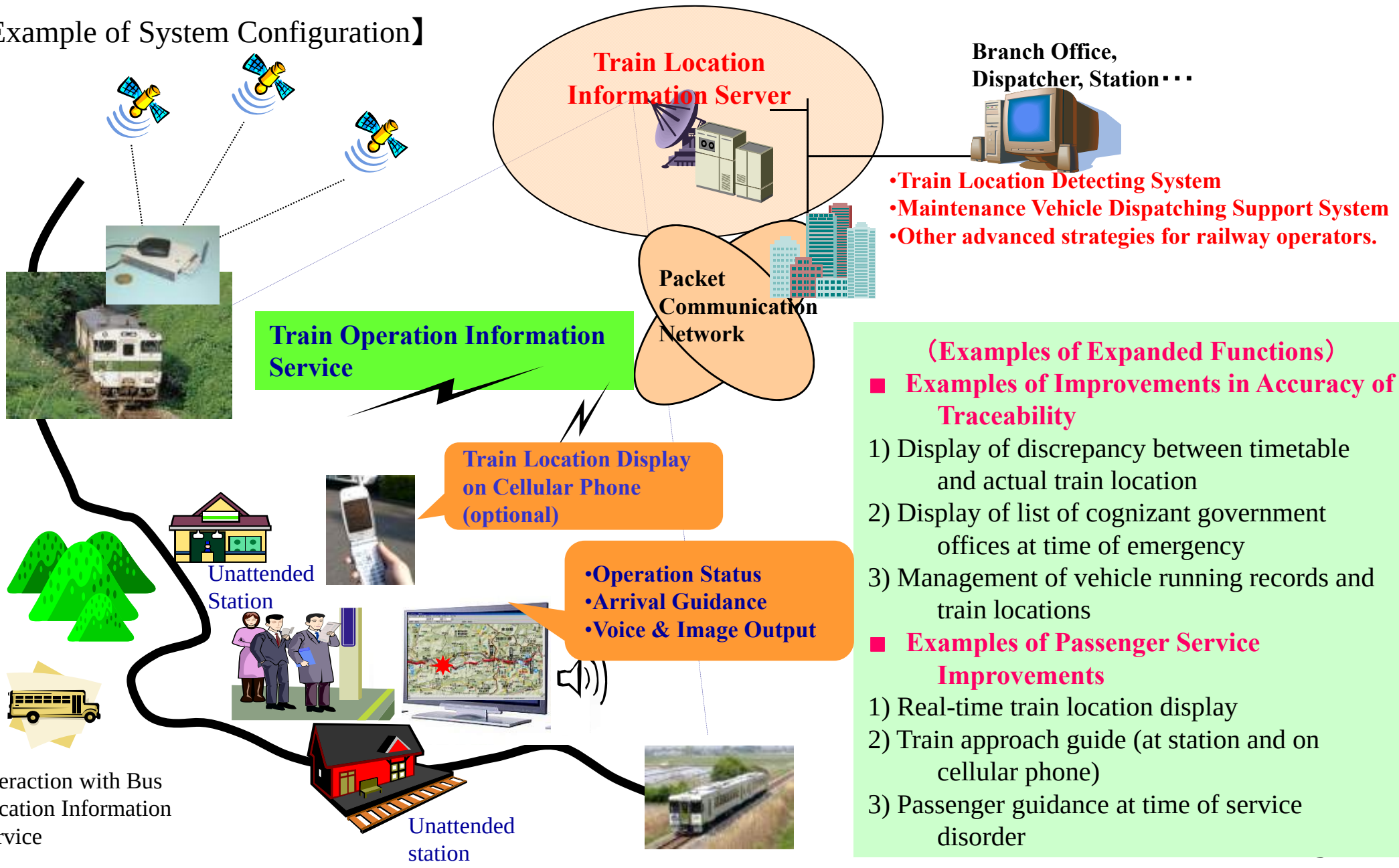
【 near the JR-EAST Buildings 】

・city planning, shopping centers and in-station retailing development, marketing

【 marketing 】

Train Operation Information Service System for Local Lines

【Example of System Configuration】



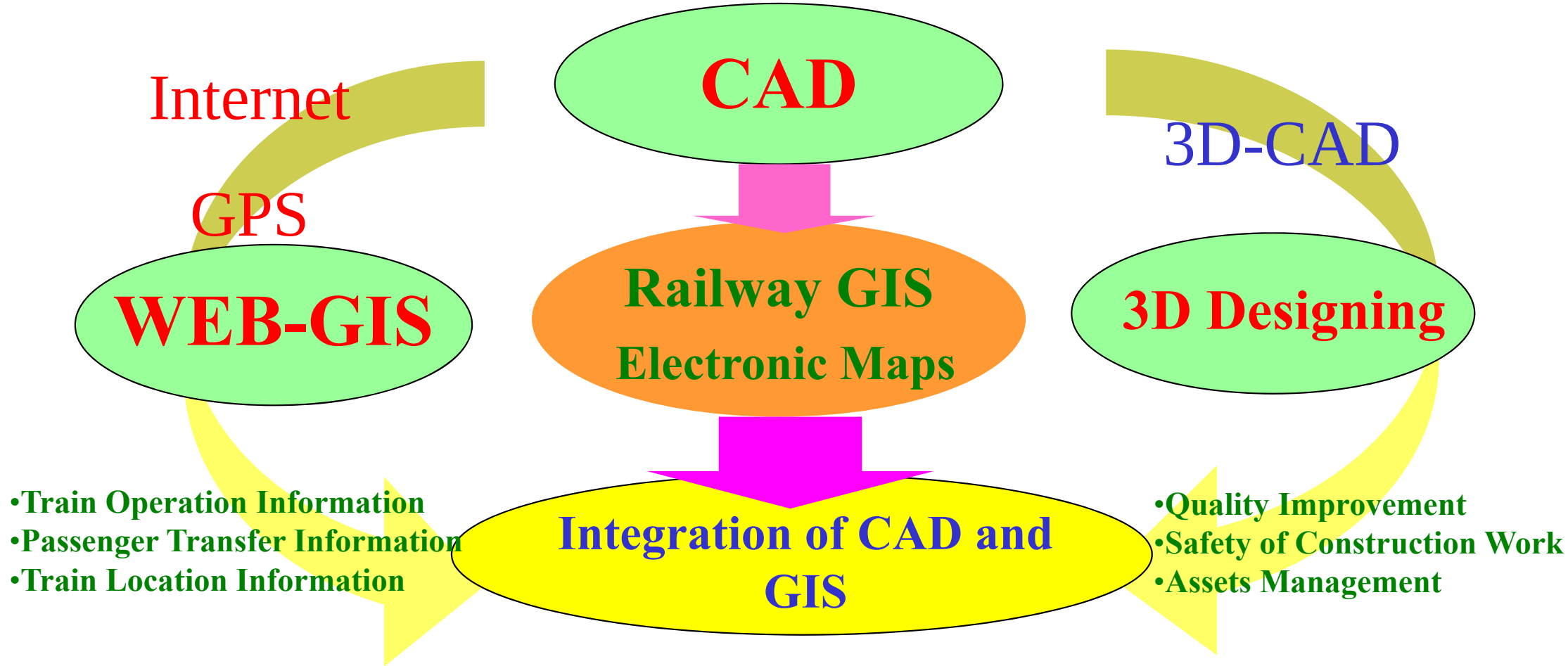
（Examples of Expanded Functions）

■ Examples of Improvements in Accuracy of Traceability

1) Display of discrepancy between timetable and actual train location
2) Display of list of cognizant government offices at time of emergency
3) Management of vehicle running records and train locations

■ Examples of Passenger Service Improvements

1) Real-time train location display
2) Train approach guide (at station and on cellular phone)
3) Passenger guidance at time of service disorder

Ending Remark

In the railway operating industry, implementation of "Digital Life Cycle Management" was started as a means to keep the created data in constantly updated conditions through their life cycles.