

Design and Implementation of Emergency 119 System

Kwang-Soo Kim*, In-Hak Joo*, Kwon-Mo Nam**, Jong-Hyun Park*
{ enoch, ihjoo, jhp } @etri.re.kr*
kmmnam@ktdata.co.kr**

* : Telematics Research Division / ETRI

** : Solution Business Part / KTData

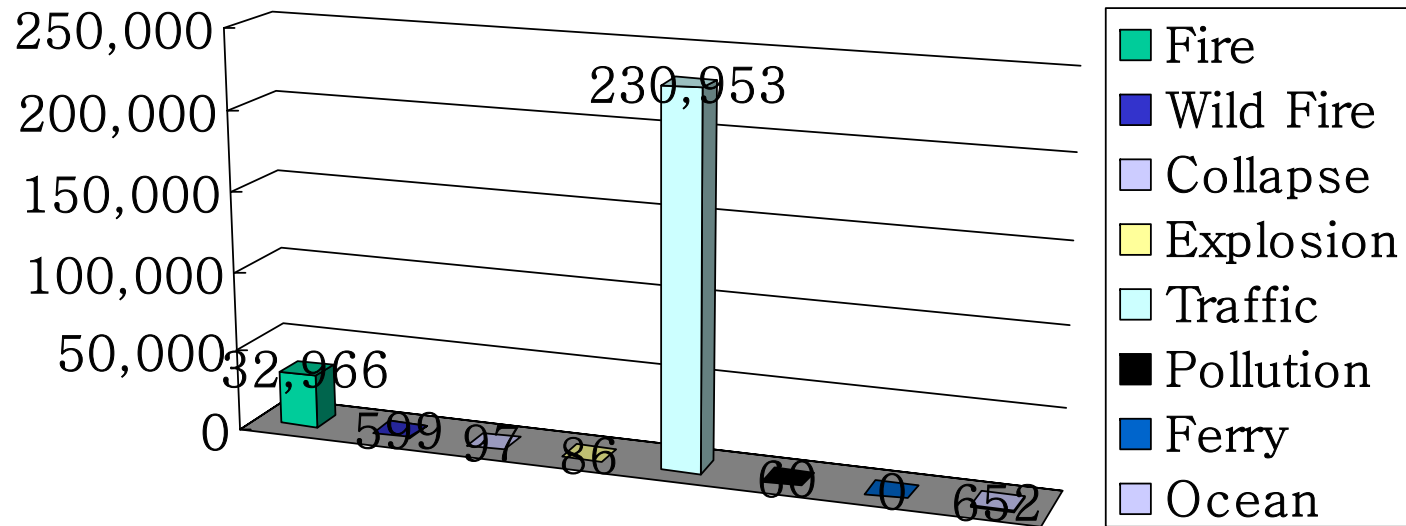
Contents

- Disaster Occurrences
- Fire Business Statistics
- User Requirements
- System Configuration
 - ◆ Mobile System
 - ◆ Fire Server
 - ◆ Fire Management
 - ◆ Fire Application
 - ◆ Web Service
- Broadcasting Scene of Fire using 4S Van
- Improvement
- Conclusions

Disaster Occurrences in 2002

Disaster

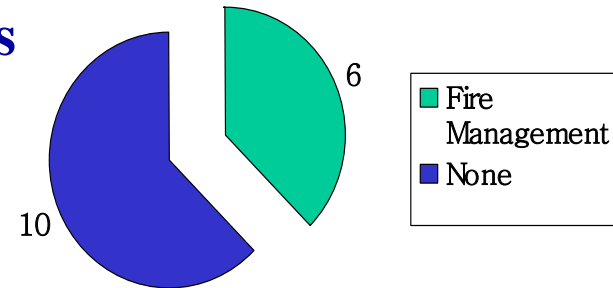
- ◆ Natural Disaster
- ◆ Artificial Disaster



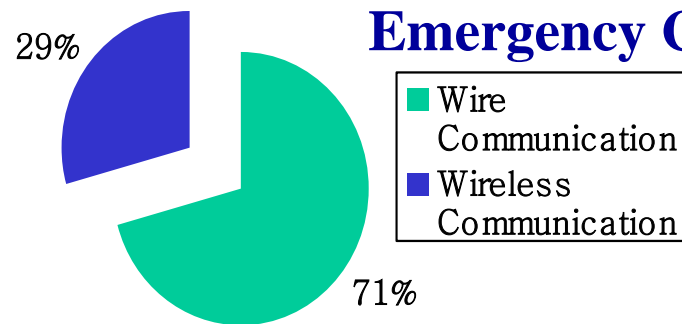
Source : 2002 Annual Report of MOGAHA

Fire Business Statistics

Headquarters



Emergency Calling

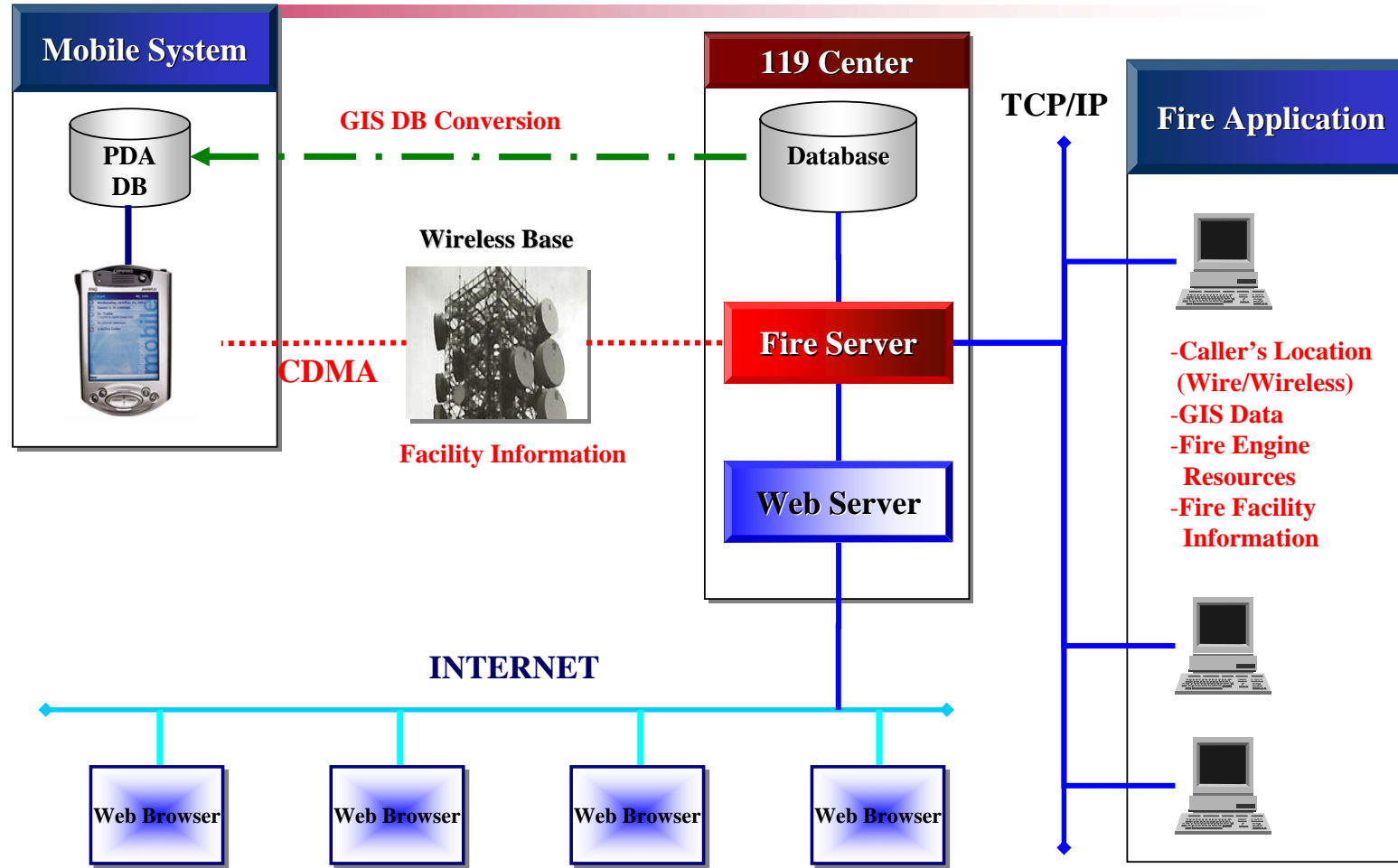


Source : 2002 Annual Report of Fire Agency

User Requirements

- Building up GIS editing system for manager
- Statistics functions
- Real-time fire facility information updating with PDA
- Web Service
- Connecting with related organizations
- Elimination of data duplication

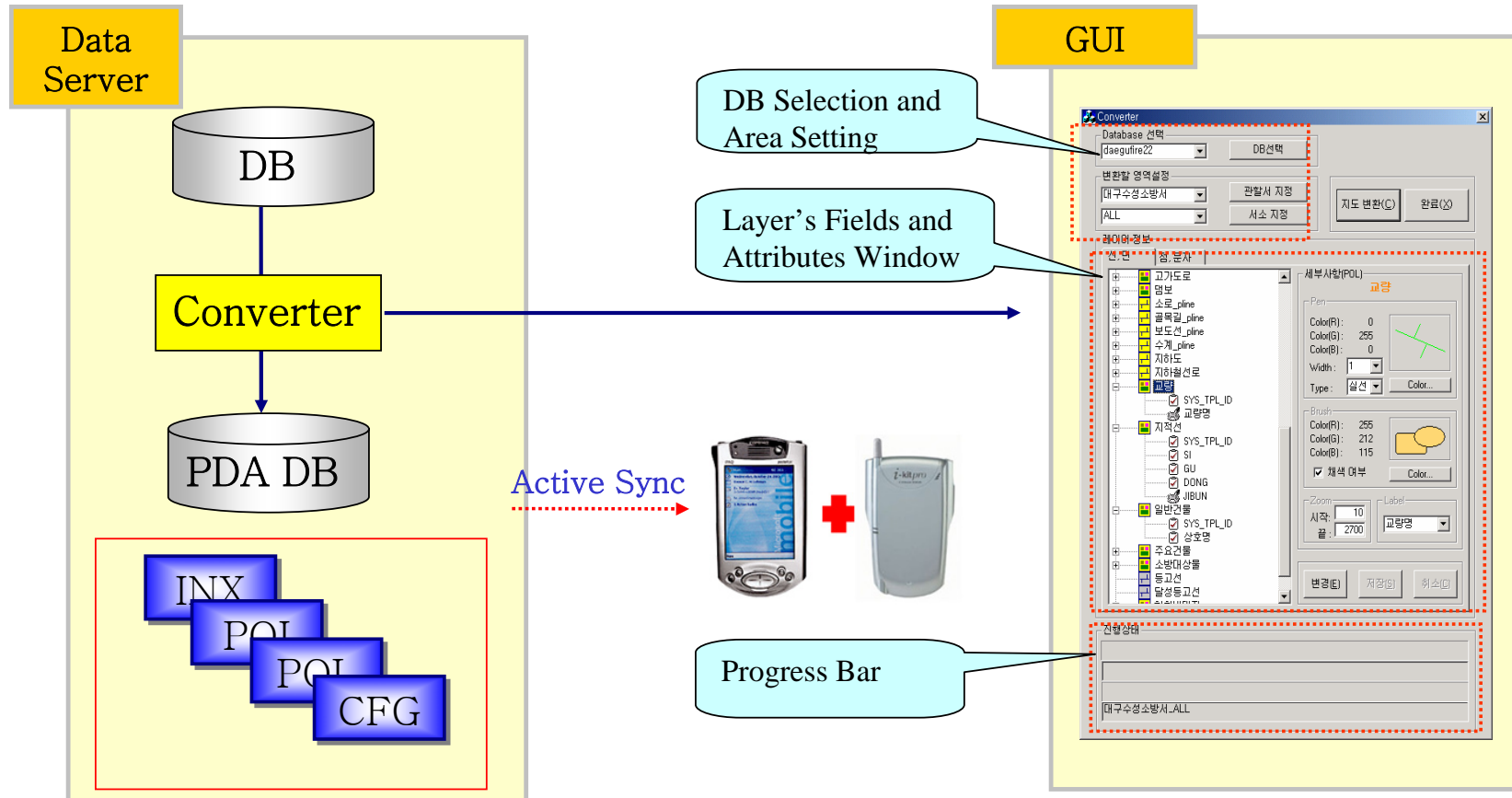
System Configuration



Mobile System

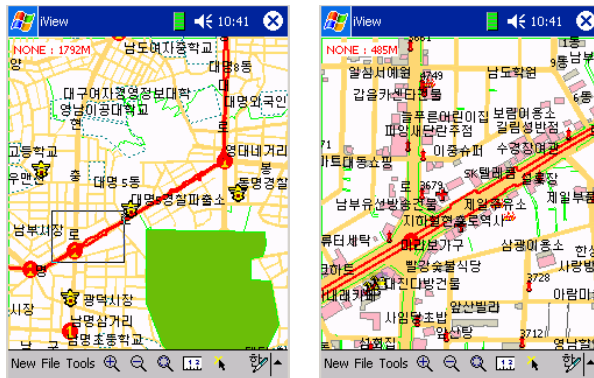
- Operating on PDA (Personal Data Assistance)
- Fire fighter carries it out to check fire facility
 - ◆ Location and Condition
- Defining Data Format for PDA
- Data Conversion between data server and PDA
- Data Clipping
 - ◆ Only working area
- Data uploading method
 - ◆ On-Line : CDMA
 - ◆ Off-Line
- Functions
 - ◆ GUI, Editing, Drawing, Searching, Managing Layers

Data Converter

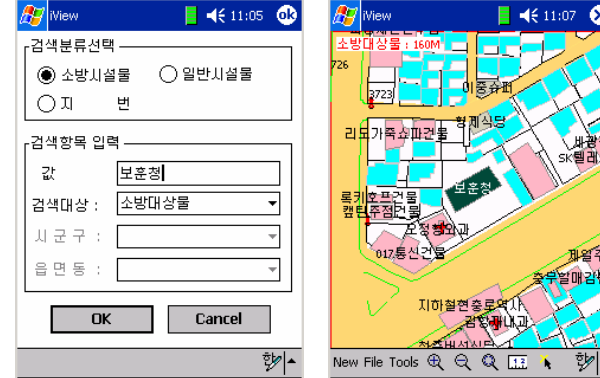


Mobile System

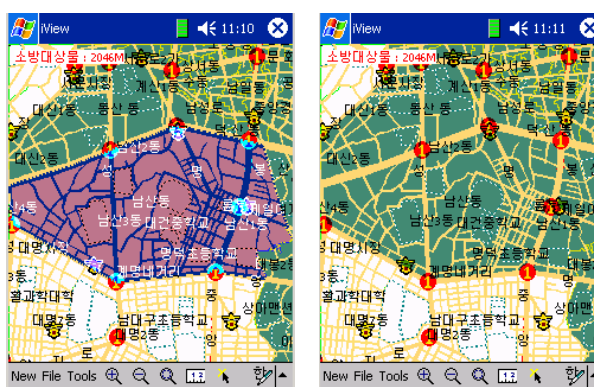
Zooming



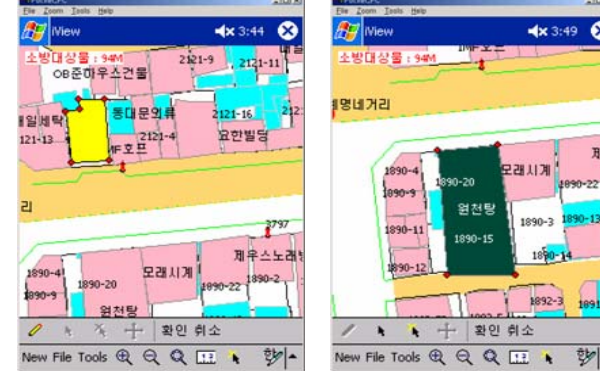
Attribute Searching



Selecting



Adding



Fire Server

- FireServer Component
- Providing constant response time
 - ◆ Multi-client control
 - ◆ Distributed processing technology : DCOM
 - ◆ Load balancing
- Connecting to Web Server
 - ◆ Sending fire information
- Synchronization and reproduction of data between headquarter and fire stations to eliminate data duplication

Fire Management

■ FireCom Component : Controller and DataProcedure

■ Controller

- ◆ Displaying and Managing map layers
- ◆ Editing spatial objects
- ◆ Searching spatial and non-spatial data

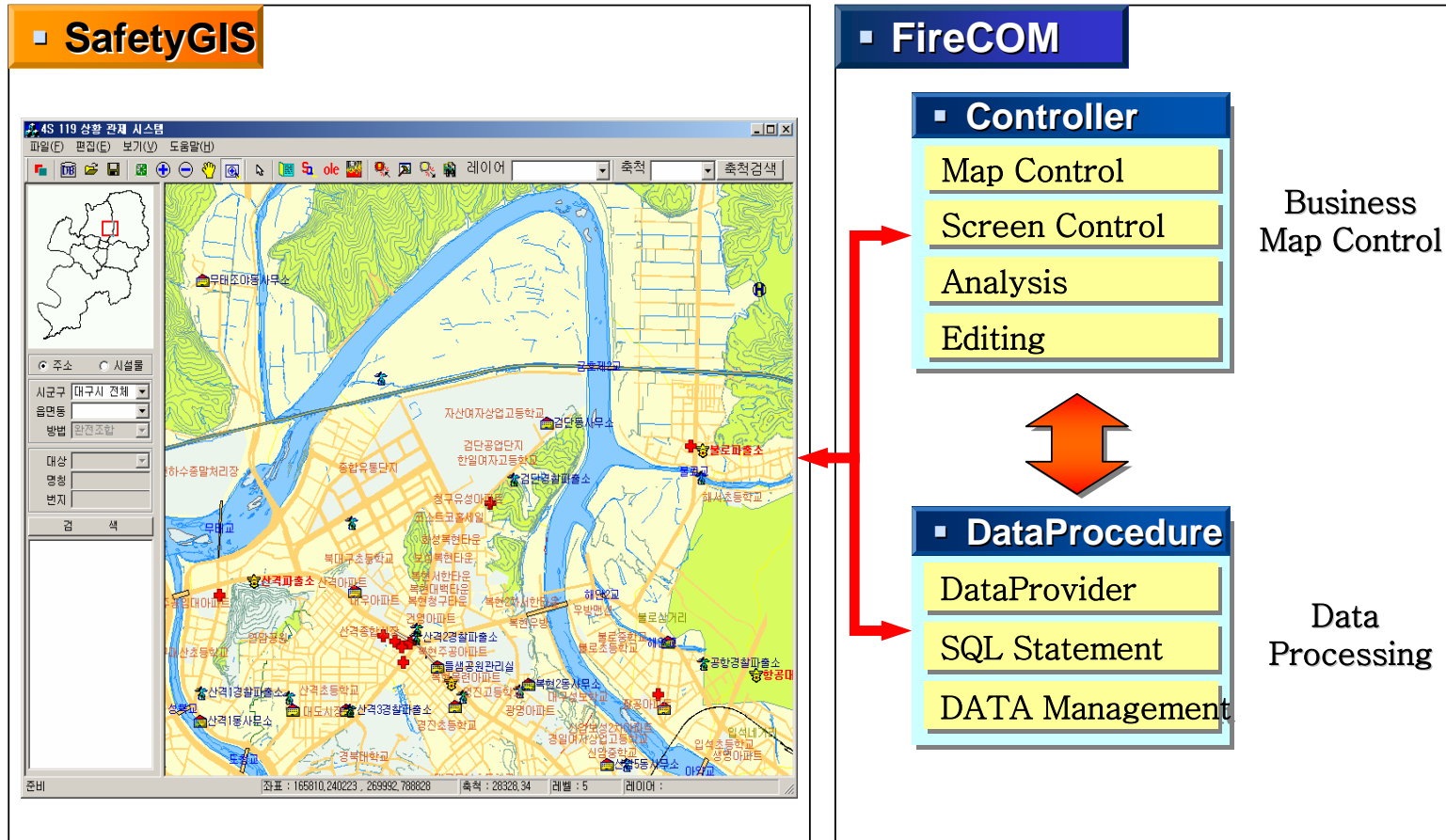
■ DataProcedure

- ◆ Connecting diverse data stores
- ◆ Conforming to OGC's Simple Feature Geometry Specification
- ◆ Capability of connecting to data sources located in different organization

Fire Application

- SafetyGIS
- User interaction
- Displaying caller's location
 - ◆ Wire phone and mobile phone
- Displaying fire engine's location
 - ◆ GPS
- Searching fire facilities information
- Fire business logic
- Based on FireCom
 - ◆ Managing, analyzing, searching, editing firing area
 - ◆ Supporting map layer control, annotation display, attribute searching, etc.
 - ◆ Connecting diverse data stores

Fire Application



Web Service

■ Web Service Data Format

- ◆ WKB(Well-Known Binary)
 - Data Communication with FireServer
 - Data Accessing to Database of FireCom

■ FireWebServer Component

- ◆ Supporting effective operation on web page
- ◆ ISAPI (Internet Server Application Programming Interface) Extension
- ◆ Connection with FireServer

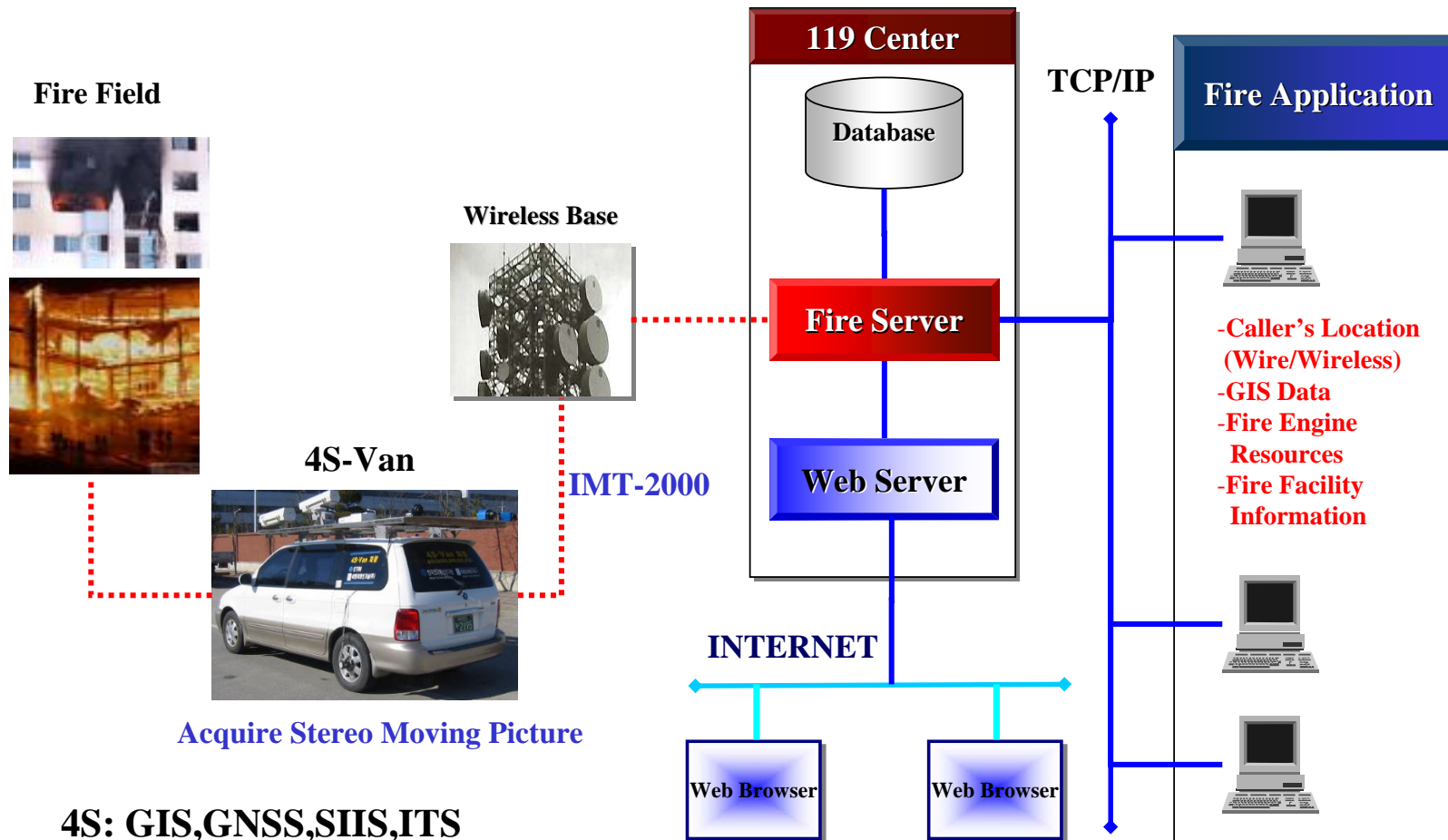
■ FireWeb Component

- ◆ Map Control on web browser
- ◆ Modifying FireCom

Web Service

The screenshot shows a web-based GIS application interface. At the top, it features a search bar for '주소 검색' (Address Search) and a '이동하기' (Move) button. The main area is a map of a city district, with various landmarks and street names visible. To the right of the map, there are several search and filter panels: '관할구역 검색' (Jurisdiction Area Search) with dropdowns for '소방서' (Fire Station) and '서소' (Sub-district); '지나현황 검색' (Current Status Search) with checkboxes for '전체' (All), '재난' (Disaster), '구급' (First Aid), '구조' (Rescue), and '기타' (Other); and '시설물 검색' (Facility Search) with a dropdown for '시설물' (Facility) and a '실시간 검색' (Real-time Search) button. At the bottom left, a 'Map Controller' toolbar is visible, containing icons for zooming, panning, and other map navigation functions. Callout boxes with yellow backgrounds and black text point to these specific features: 'Address Searching' points to the top search bar; 'Area Searching' points to the '관할구역 검색' panel; 'Statistics' points to the '지나현황 검색' panel; 'Facility Searching' points to the '시설물 검색' panel; 'Main Map' points to the central map area; and 'Map Controller' points to the bottom toolbar.

Broadcasting Scene of Fire : Future Work



4S-Van H/W



Camera



POS_LV(GPS+IMU)



Laser



Control Box

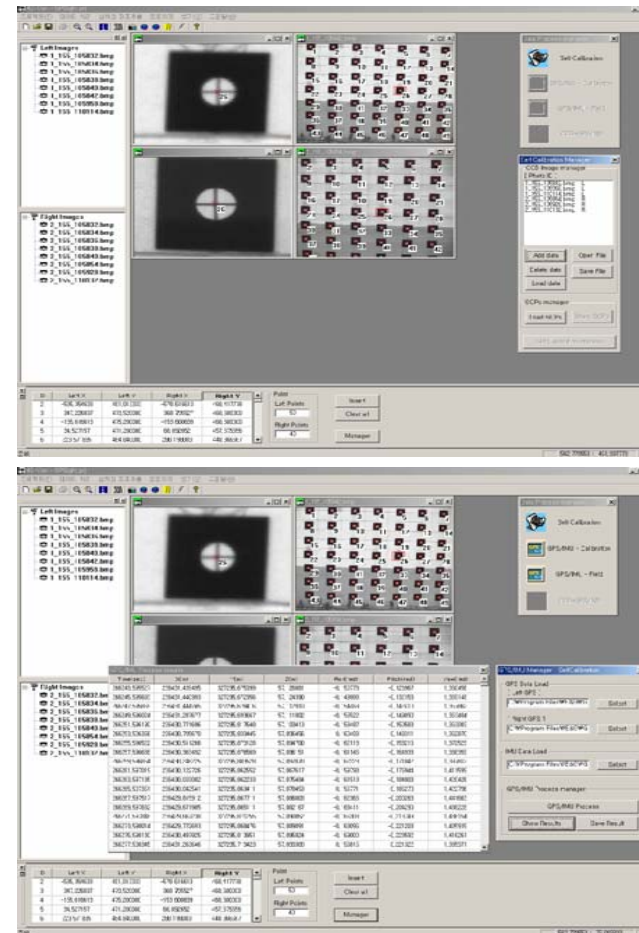
4S-Van S/W (1/2)

Self-calibration

- The Calculation of EO/IO for GPS/INS
- 3 image pairs(front, right, left)
- Targets measured by Total station
- Radial distortion of CCD Camera
- Focal length of CCD Camera
- Principal point

GPS/INS/DMI Integration

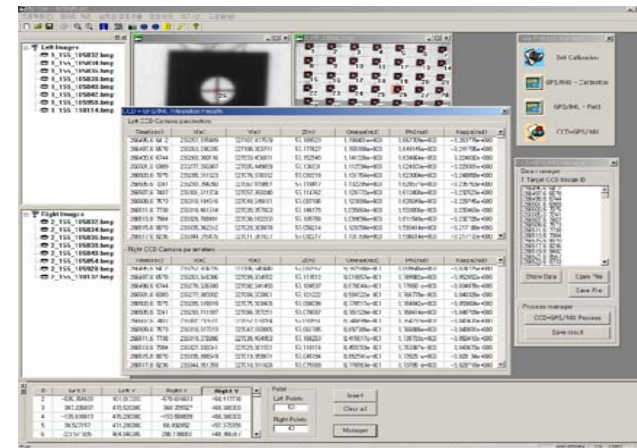
- GPS/INS/DMI Integration via Kalman filter/smoothing
- Calculate position/attitude for GPS/INS/CCD
- Calculate position/attitude while running



4S-Van S/W (2/2)

GPS/INS/CCD Integration

- Calculate exterior orientation of CCD using position and attitude of GPS/INS/DMI
- Using acquired exterior orientation by self-calibration



3D Coordinate of Object

- Calculate 3D information using CCD image
- By space Intersection



Improvement

- Shortening facility management working hours
 - ◆ Field Check->Returning to Office->Input → Field Check • Input
- Improving system extension by conforming to domestic or international standards
- Data sharing among related organizations
 - ◆ Improving an ability for extinguishments of fire in the field
- Connecting to the project, Mobile Location Determination System for 119, of MOGAHA(Ministry of Government Administration and Home Affairs)
 - ◆ Location determination of users using mobile or wire communication
- Information sharing by real-time providing the information of control center to all offices and people in a fire agency
- Advancing data reproduction and update

Conclusions

- Implementing some components related to fire management
 - ◆ Mobile Editing, FireCom, FireServer, SafetyGIS, Web Server
- Adopting Open GIS Standard : Interoperability
 - ◆ Internal data format
 - ◆ Connecting to external organizations
- Expectation Effects
 - ◆ Improving fire service to the public
 - ◆ Minimizing the harmful effects by fire

- Future Works
 - ◆ Being field test
 - ◆ Refining all functions according to the requirement of the officers in the control center
 - ◆ Integrating image of 4S-Van with Emergency 119 system

2004 TIEMS Workshop in Korea

ETRI in Daeduk Valley



Thank you for your attention!

www.etri.re.kr