EPSON
EXCEED YOUR VISION

# GPS History & Future

SEIKO EPSON CORPORATION



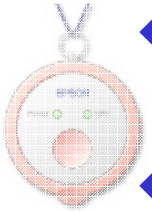
# Introduction

# EPSON GPS History

EPSON
EXCEED YOUR VISION

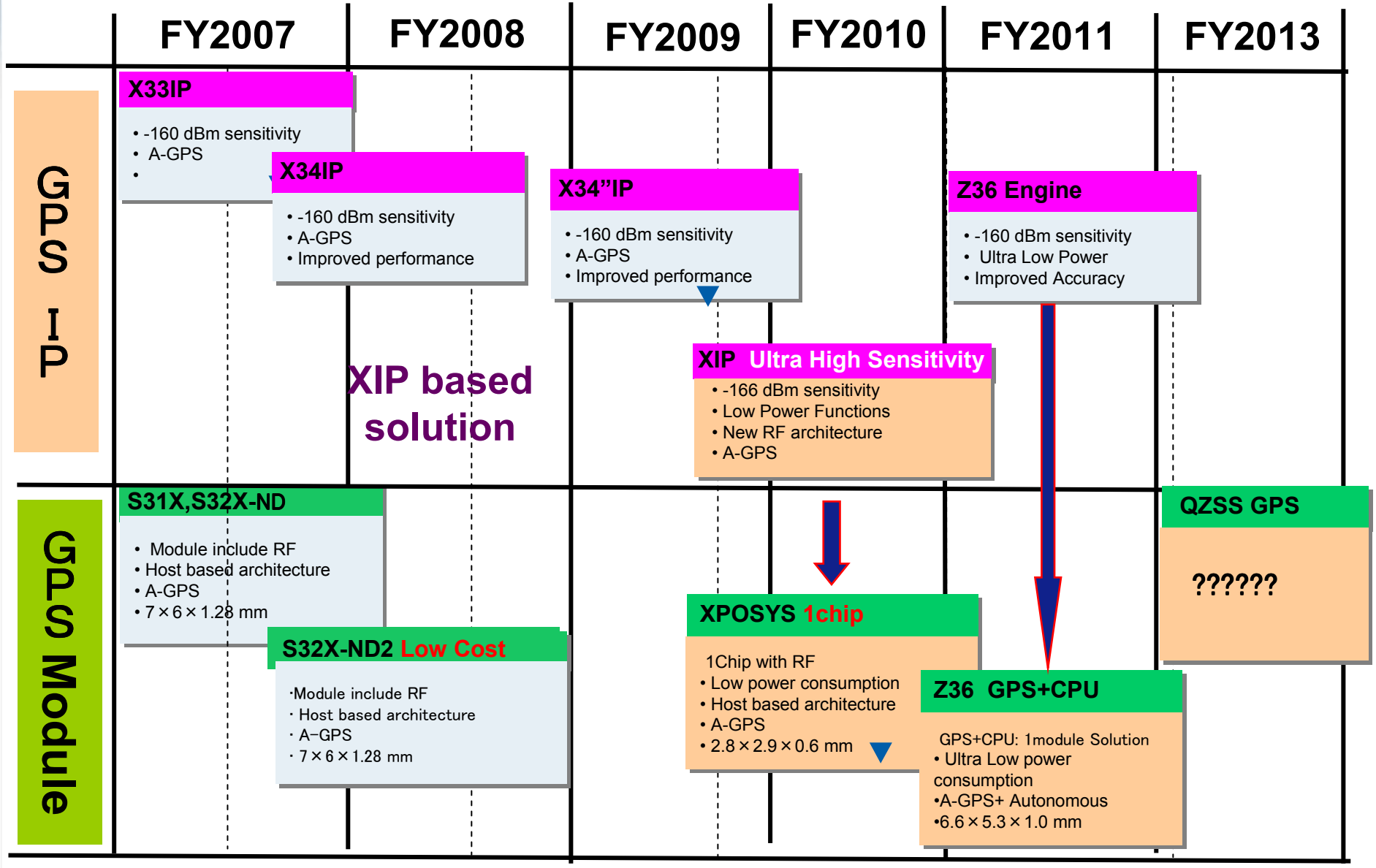
## History

- 1996: Developed world wide No1 low power GPS.
- 1998: Launched “Locatio” the PDA with GPS.
  Started “i-Point” , Location based web service with DG
- 2000: Provided A-GPS assistance server for NTT docomo 2G
- 2003: Launched the handy GPS equipment for children & elderly
- **2006: Providing GPS module for ALL NTT docomo phones on 3G.**
- **2007: Providing GPS BB-IP for WCDMA platform device in Japan.**
- **2010: Launch XPOSYS (July) : World wide No1 sensitivity CMOS 1chip GSP solution with Infineon.**
- **2011: Launch Ultra GPS module (Z36)**
- **2012：Launch SEIKO ASTRON （GPS Watch）**
  **Launch Wrist Run （GPS Logger）**
- **2013：Provide GPS Module for QZSS**



# GPS product Roadmap

EPSON
EXCEED YOUR VISION



# Ultra high sensitivity 1Chip-GPS（XPOSYS）

EPSON
EXCEED YOUR VISION

## Feature

- **CMOS 1Chip GPS**
  **World Wide leading technology : RF-CMOS technology by Infineon Technologies (German)**
  **65nm Process Size**
  - **RF 1chip (Reduce Analog design work)**
- **High Cost Performance : Low Chip Cost & High GPS Performance**
  - World wide No.1 performance & the minutest process & low cost 1 Chip GPS module

## Specifications / Functions

- **High Sensitivity : -165dBm**
  - The highest sensitivity
  - Improve GPS performance at middle level GPS signal strength area(-135dBm - -155dBm)
- **Small Package : 2.8mm × 2.9mm × 0.6mm**
  - WCSP
  - 0.4mm Pitch
- **Low Power Tracking Mode equipped**
  - Tracking Mode⇒Low Power Tracking: Power consumption reduce
- **Energy saved by profile**
  - Set power mode by profile ---Change High sensitivity or Energy saving
- **Small Board Space**
  - Decrease the number of the peripherals ----Reduce the space & cost（ < 30mm2 ）
- **Variable Clock :10～52MHz**
- **Host Based Arctecture**
- **Uni power supply / Low Voltage supply**
  - 1.8V Uni power (Include RF)
  - Power supply / Low Voltage supply

# Low Power Z36 Module

EPSON
EXCEED YOUR VISION

- Concept
  - ◆High sensitivity GPS with Ultra low power
    (The world wide No.1 lowest power consumption)
- Feature

**Tracking power consumption : 20mW (50% lower than others)**

- ◆Sensitivity (Hot start) :-160dBm
  (Cold start):-146dBm
- ◆Accuracy :<5m (Outdoor)
- ◆Standard NMEA output (UART)
- ◆SPI (Light protocol use)
- ◆Working interval : Available to set
- ◆Data for performance analyze : Available to output

# GPS Watch (ASTRON)

EPSON
EXCEED YOUR VISION

The world first GPS watch by SEIKO

(Launched September 2012 )

EPSON EXCEED YOUR VISION ⇒ SEIKO

Low power GPS module

GPS Signal Receive ⇒ Accurate time

Position (Recognize time zone)

Available 39 time zones all over the World

Receive time signal in the vehicle or walking

Available on summer time zone

Provide flight mode (GPS receive off mode)

100% Solar Power Watch (Low power GPS use)

GPS ring antenna

# Wristable GPS(EPSON)

EPSON
EXCEED YOUR VISION




GPS watch for athlete-Use low power GPS

## Get Position by GPS & Sensor

Open Sky ---- GPS

Urban canyon ---- Sensor (Stride sensor)

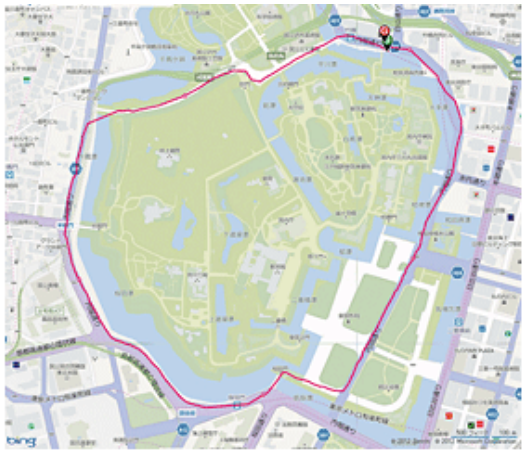
Thin antenna built in


薄型フラットアンテナ

Recognize the pulse

Calculate the calorie consumption

Connection with Smart phone application



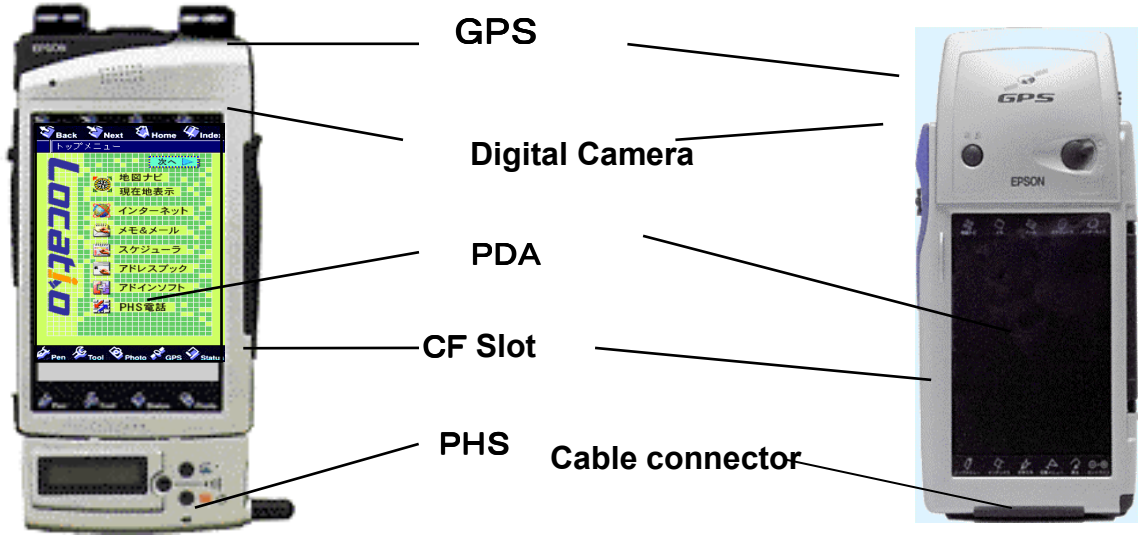
EPSON
EXCEED YOUR VISION

# History of Location Business

# The First Smartphone (Locatio)

EPSON
EXCEED YOUR VISION

## 1999: EPSON launched GPS mobile Phone “Locatio”




1998年: Pre-Marketing model for ANA (Provided at Hanada Airport)

1999年:Launched consumer model

2000年:Lower price model launched

# Locatio Application

EPSON
EXCEED YOUR VISION



Get the position by GPS or PHS

Internet access

Mapping

Get information by Multi media mail

Connect with PC

Take pictures by DSC

Send own position & pictures by Multi media mail

Privacy management

# Location Service Platform (i-Point)

EPSON
EXCEED YOUR VISION

**EPSON provided the network service for position information named**

**「I-Point]**

*DGPS service*

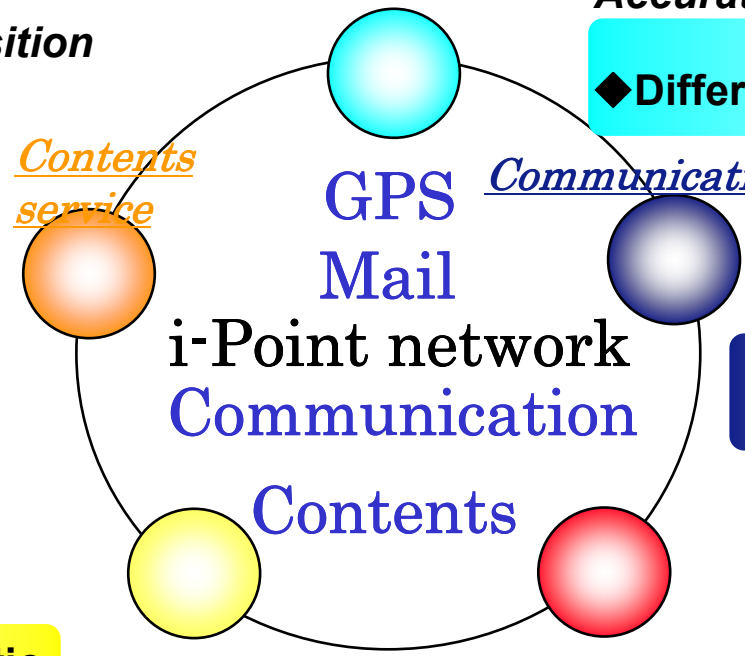
*Position by PHS*

***Accurate position data***

**◆Differential GPS service**

***Contents service with position parameter***

- **Point to Point Navi**
- **Contents search**
- **Yellow page with the position**




*Contents service*

*Communication service*

***Multi media communication include position data***

**◆Message board on the map）**
**MM mail**

- **Seamless with PC&Locatio**
- **Provide access points**

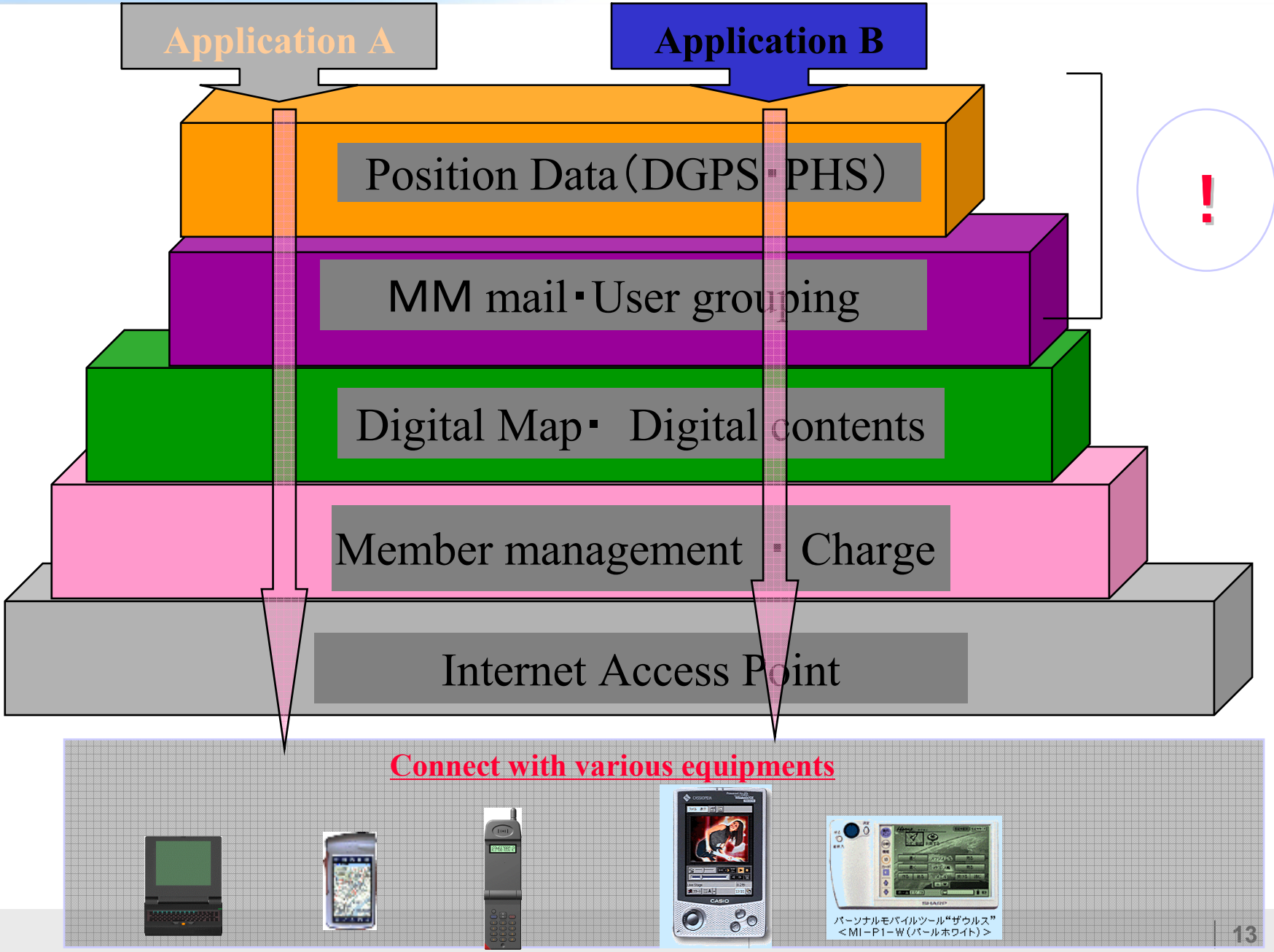
*ISP service*

*Personal data service*

**Multi media mail (MM mail)**

# i-Point network structure

EPSON
EXCEED YOUR VISION

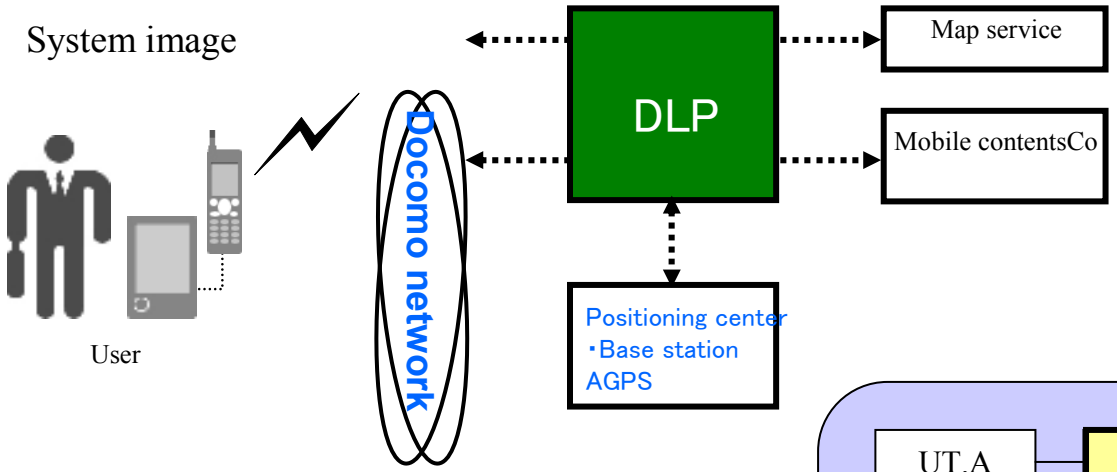


# Docomo Location Platform (DLP)

EPSON
EXCEED YOUR VISION

**NTT docomo started to provide position data platform service in 2001**

**「DLP」(DoCoMo Location Platform)**

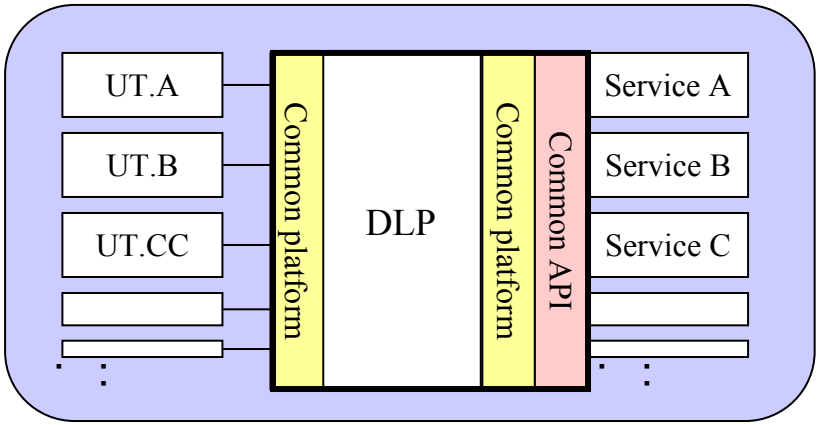



**DLP**

Common platform service by NTT docomo

Define position data management and protocol

Free carrers service for GPS equipment



# History of GPS cellular phone

EPSON
EXCEED YOUR VISION

NTTドコモ（PDC、W－CDMA）

F661：Launched 2002　PDC method
The first GPS cellular phone by docomo
GPS：Qualcomm（-148dbm）

F505iGPS： Launched 2003：PDC method
GPS：Qualcomm（-148dbm）

**WCDMA service was from 2005**

au（CDMA-1x CDMA-2000）

2001：The first GPS cellular phone was launched　　Approx.10M
GPS：Qualcomm（-148dbm）

# Application service for GPS cellular phone

EPSON
EXCEED YOUR VISION

## Security service

Security service

Location search of infant child & old people by cellular phone

Emergency mail service with position

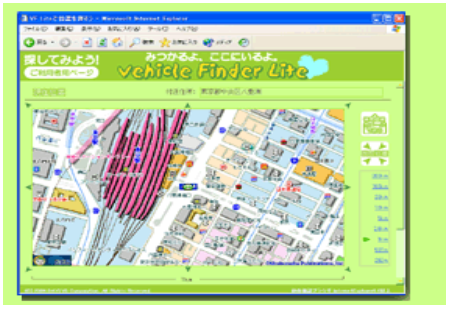
} Security officer go to in case of emergency）

## Family search

**Easy to get the location among family (Not related security company)**

**Easy to get the position of own vehicle**

**Mail service which can sent own position**





Vehicle Finder Liteイメージ画面

## Emergency service at climbing & sailing

**SOS call with position at mountain & the sea**

# Application service for GPS cellular phone2

EPSON
EXCEED YOUR VISION

Navigation

**Navigation service by Navitime Japan**

NTT DoCoMo
au（KDDI）

**Navitime Japan provided Navigation service both docomo and au**

## Function

### Map search

Search the contents by position Address Telephone number and landmark

### Navigation Service

Route information by Train Vehicle and walking

### Train information & Time table

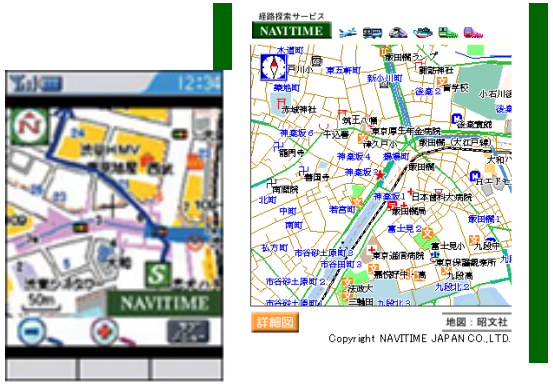
Train connection information based on time table

### Around contents search

Spot information around the position

### Map mail

Send map URL by mail



# EPSON business performance

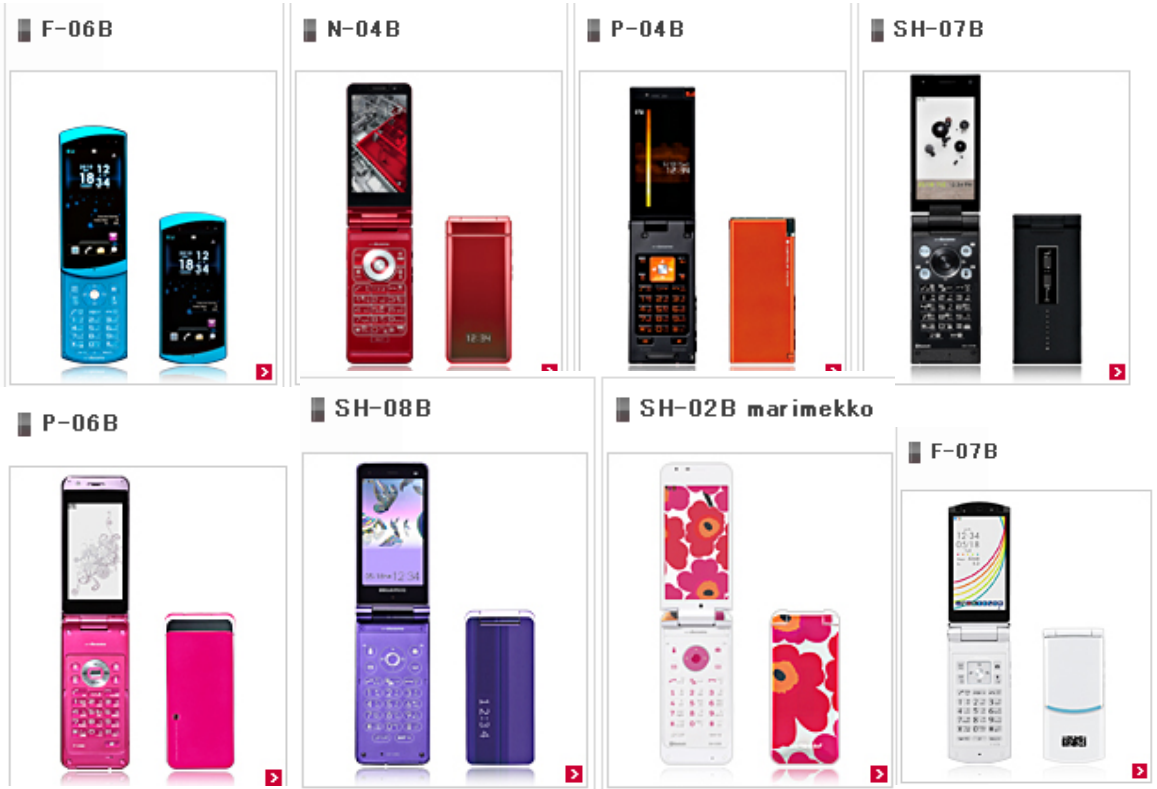
EPSON
EXCEED YOUR VISION

NTT docomo

**EPSON GPS share : Approx. 100% for docomo GPS cellular phones**

**EPSON shipped Aprox.43M GPS for domestic GPS cellular phones**

**(GPS module & GPS-IP)**



# Auto GPS service by docomo

EPSON
EXCEED YOUR VISION

## Auto GPS service

**NTT docomo started new GPS application service from 2009**

GPS cellular phone get the position in every 5 minutes automatically and that position is sent to the application server.

The application server sends various information based on the position according to the cellular phone owner preference.

-Point weather forecast, Good restaurants, Time table of transportation, Navigation, Map information etc.

Many subscribers are interested in GPS function in cellular phone

⇒The volume of GPS cellular phone increases

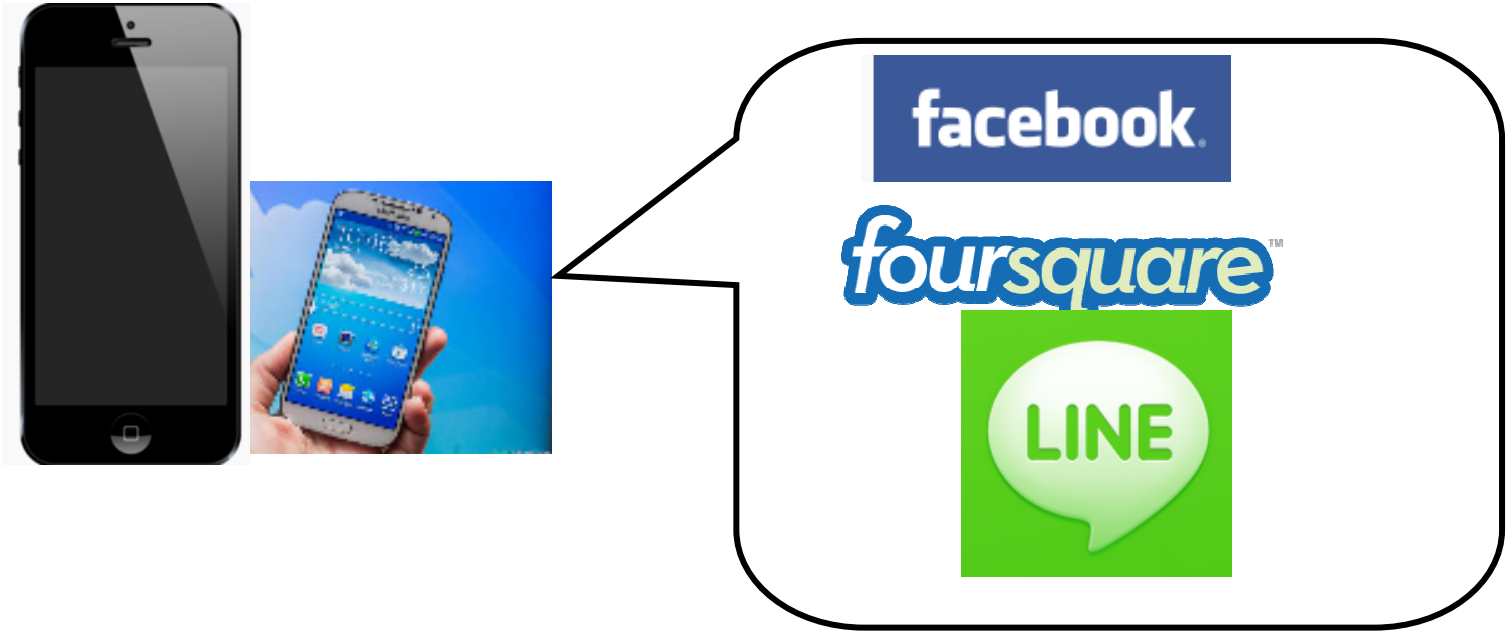
Low power GPS is important for Auto GPS service

The seamless positioning is important mixed with sensor solution

# Smart Phone in GPS

EPSON
EXCEED YOUR VISION

The evolution for GPS




People up own position to the Application board without any hesitation

Smart phone GPS has to improve for power consumption and sensitivity

# Future

# GPS Market Potential

EPSON
EXCEED YOUR VISION

GPS, Galileo, Glonass, QZSS, Compass start to service (Multi GNSS)

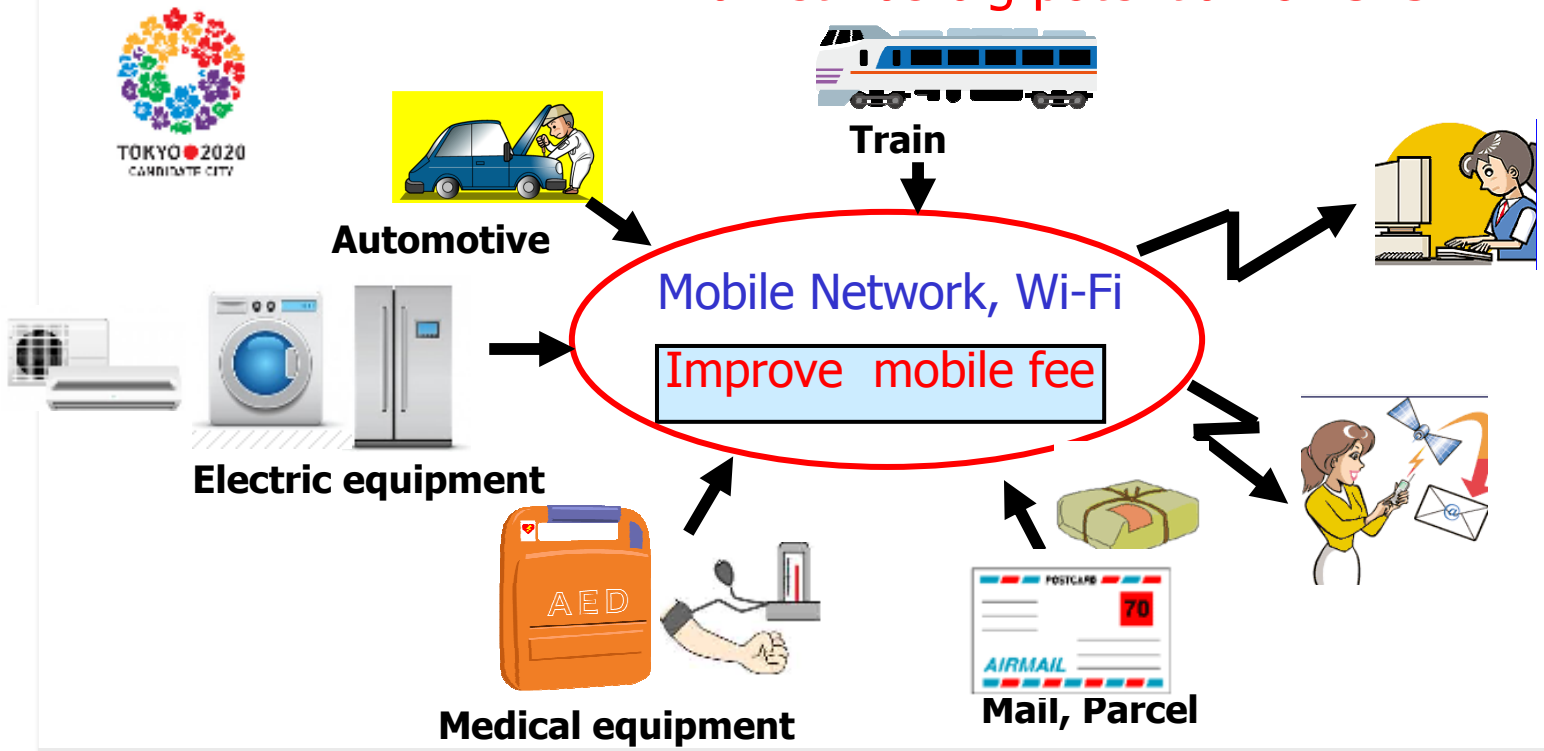
⇒Easy to get accurate position include floor information in everywhere

⇒Fast TTFF (Saved power)

Low power consumption GPS module are provided

⇒Easy to build in small equipment with small battery

M2M market has big potential for GPS

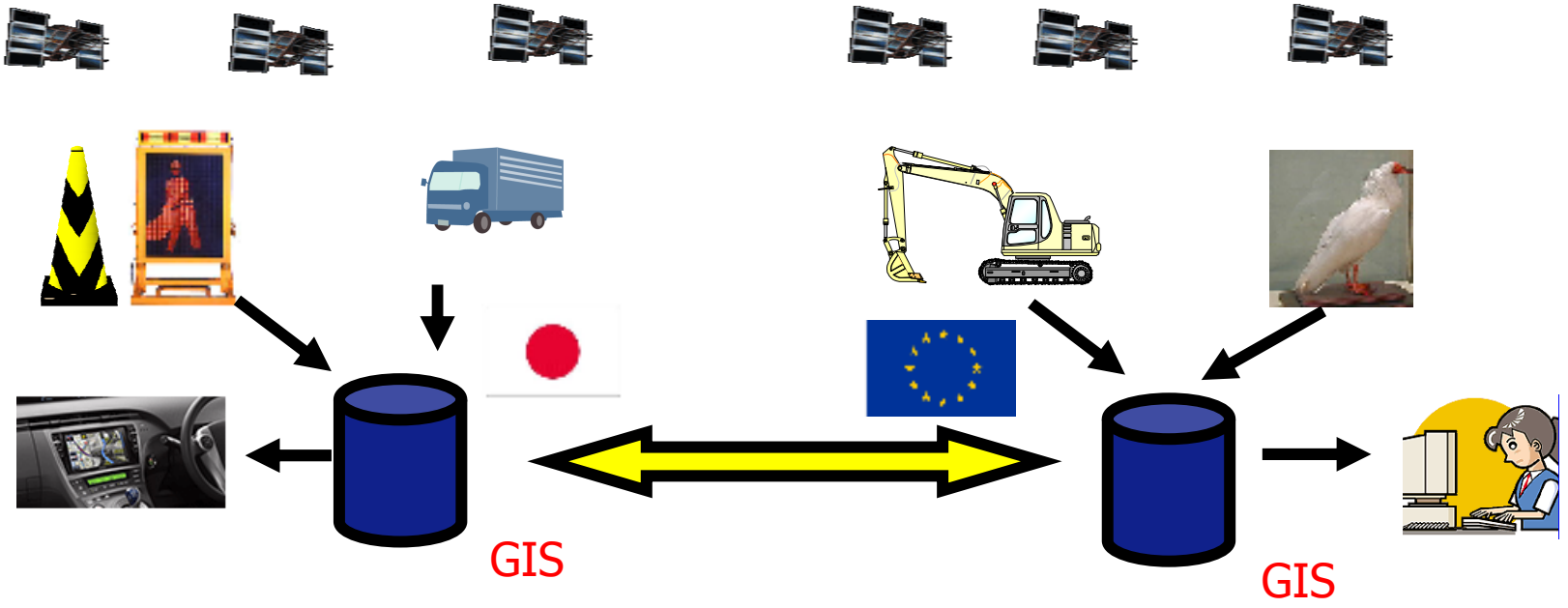


# Location Based Platform

EPSON
EXCEED YOUR VISION

EU & Japan should cooperate to build common location Platform

(GIS platform) to accelerate location business




All position data saved on the same GIS

Vertical consolidation of various field Position information

Common protocol and API should be defined

(Compliance with 3GPP, ETSI, M2M-Consolidation)

Mobile careers and network (Wi-Fi) free.


EPSON
EXCEED YOUR VISION