Global LOCATE

IndoorGPS®

Industry-Leading A-GPS Technology for Mobile Wireless Devices

Semiconductor Products
Network Infrastructure Products & Data Services

PRODUCT UPDATE 2005

GLOBAL LOCATE CONFIDENTIAL / MAY 2005

Presentation Agenda

- Global Locate company overview
- The End-to-End A-GPS solution
- Operator Activities and Interest in A-GPS
- A-GPS semiconductor products and solutions
- Performance and competitive analysis
- Summary

Company Overview

- Founded in 1999
  - Headquarters in San Jose
  - Sales offices in NJ, Spain and Japan
- +60 employees
- IndoorGPS™ ICs optimized for cellular handsets
- A-GPS network products and services
- Superior performance proven through carrier trials
- Key design wins in network and handset segments
- GSM and UMTS product focus

Intellectual Property

- **104 Patent Applications filed**
  - ***24 Patents issued covering***
    - WWRN
    - LTO (multi day ephemeris information)
    - Massive parallel correlation
    - Time-free GPS
    - Terrain Model Assistance
    - Assistance data for increased sensitivity
  - ***Priority back to 1999***
- **GL has conducted a complete infringement analysis**

  GL Technology require no 3rd party licenses
- **Global Locate Trade Secrets**

  Unique hardware architecture

  Search, multipath mitigation, navigation algorithms

  Tuned, optimized through extensive field trials

Market Presence and Strategic Partnerships

- **Existing Supplier to Nextel, and Southern Linc**
  - Two year deployment with better then “five nines” up time
- **Partnerships with major Network Equipment Vendors worldwide**
  - Partners Resell or Embed GL Network Technology
  - Signed Most of the Major NEV Players (80% market supplier coverage)
- **Development Partnerships with major Cellular Platform providers**
  - Infineon, Ericsson Mobile Platforms, others
- **Joint Development with Infineon on Hammerhead, a Single-Chip A-GPS IC**
  - “Category-Killer” Product Based on GL IP and State of the Art Infineon 0.13 RFCMOS Process Technology
- **Handset Design Wins**
  - Commercial Handsets to be Introduced in 2005

Global Locate
End-to-End
A-GPS Solutions

Global Locate Products

- **IndoorGPS™ ICs**

  GL-20000, Marlin
  GPS Baseband Processor IC

  GL-LN22
  Integrated Front End IC

  Manta-Ray
  System-In-Package
  Baseband, Front End and passives

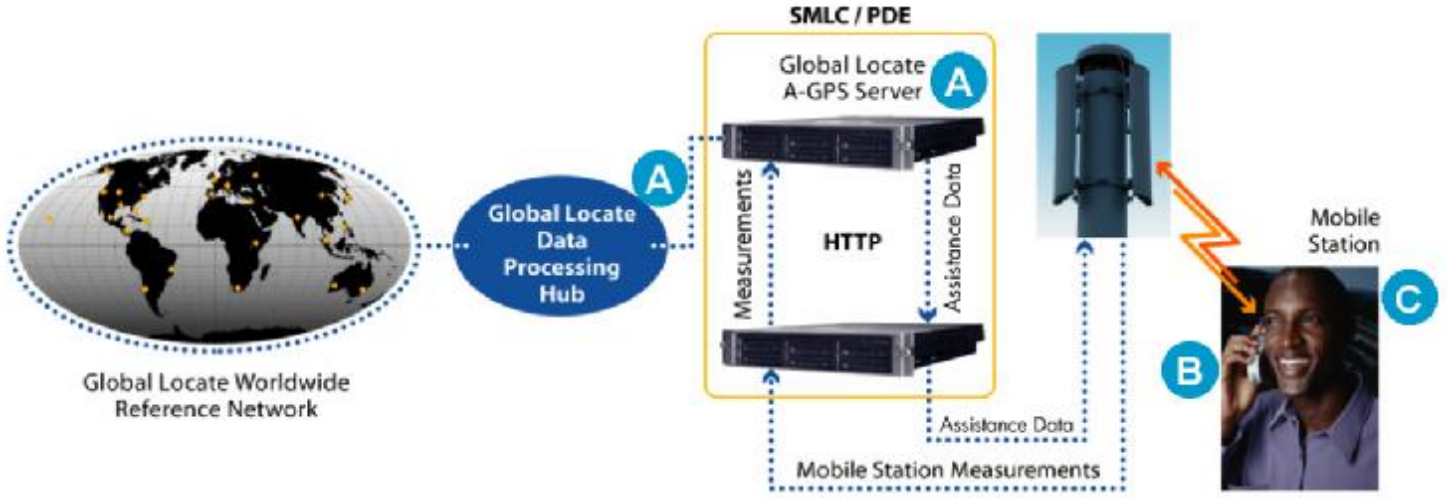
  Hammerhead
  Integrated Baseband and Front End IC

- **A-GPS Server**
- **LTO Commercial Server**
- **Worldwide Reference Network**

  Satellite data feed for A-GPS Server

Carrier & Handset Focused Sales Effort

A-GPS E2E Supply Chain

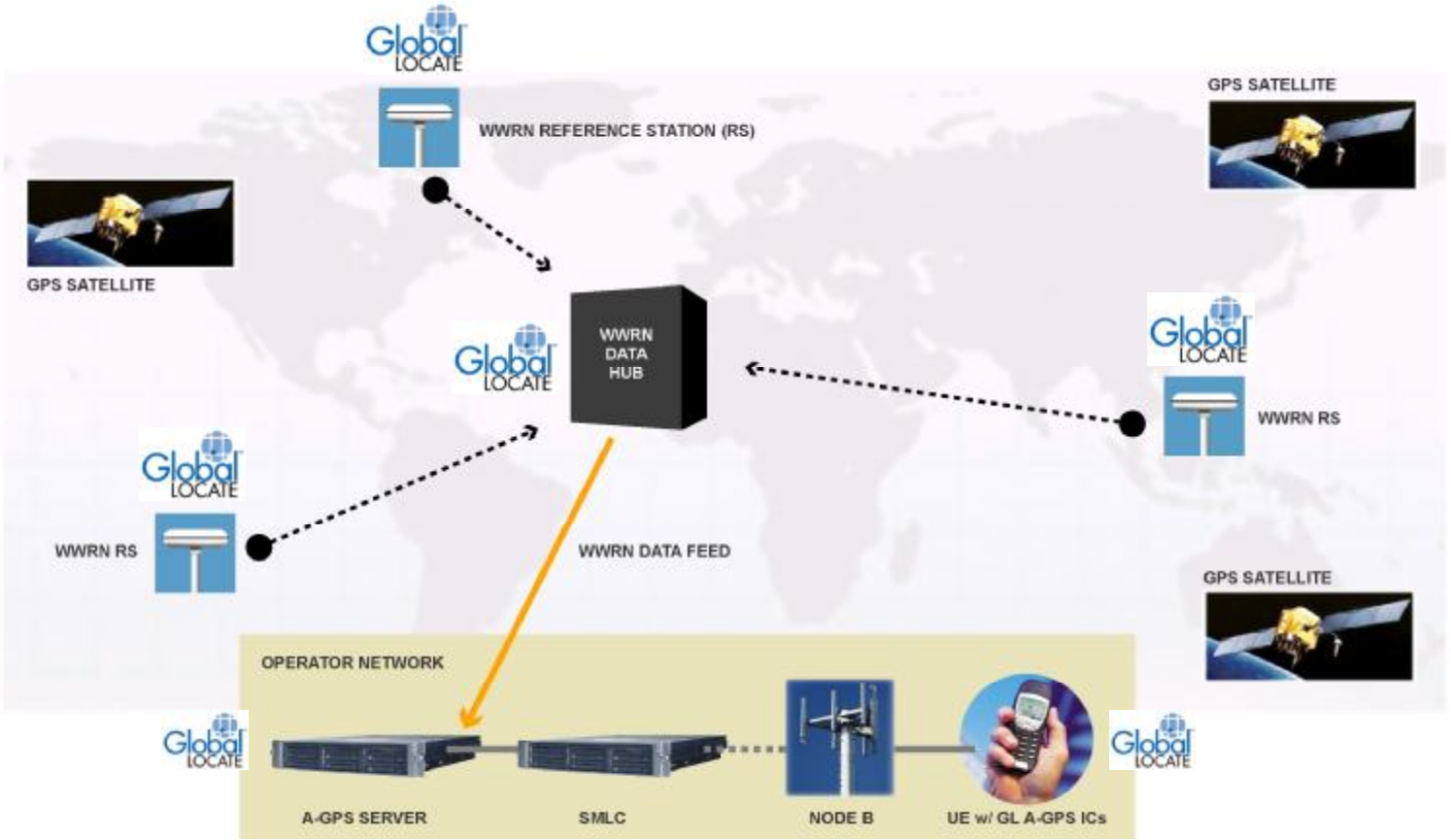


A **Mobile Network Operators, Network Equipment Vendors, Hosted Service Providers**
A-GPS data services and software

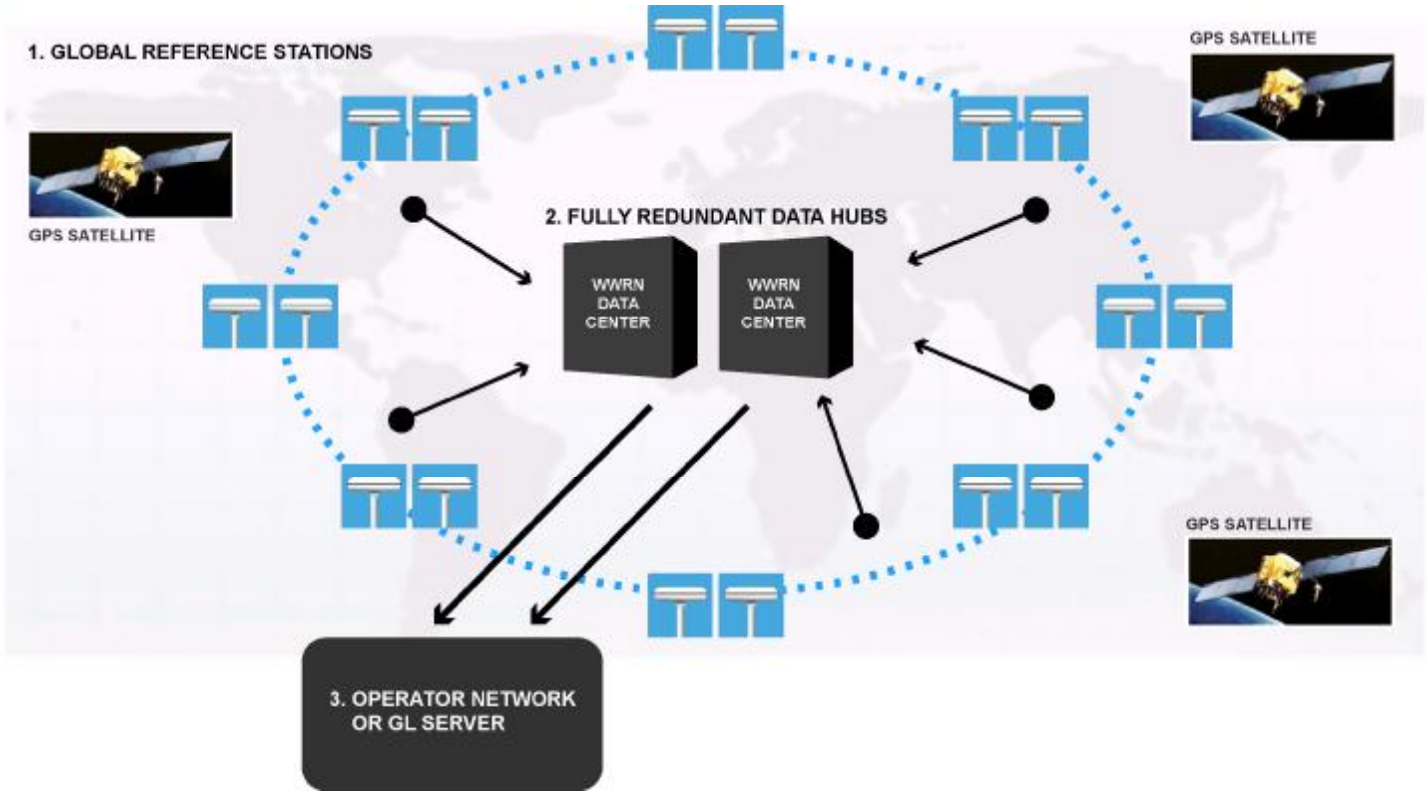
B **Mobile Device Manufacturers, OEM Module Manufacturers**
IndoorGPS™ Chip Set

C **Semiconductor Suppliers, Vertically Integrated Manufacturers**
IndoorGPS™ Baseband IP Core

GL End-to-End A-GPS System Overview



GL World Wide Reference Network Overview

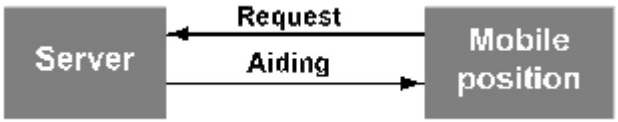


A-GPS Network Key Features and Benefits

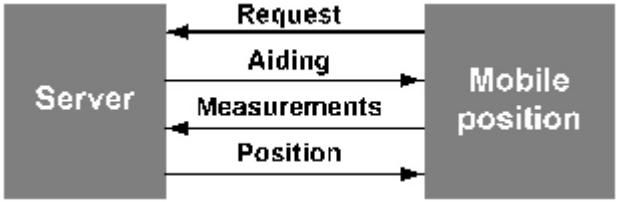
- **Global Coverage**
  - Fully deployed and operational since Q1 ’02
  - Single solution for multi-property global roaming
- **Turn Key Service Solution**
  - Operators do not need to deploy GPS infrastructure
  - Compatible with many network equipment vendors
- **Optimized GPS Performance and Unique Capabilities**
  - Real time data from the full GPS constellation
  - Multi-day advance ephemeris for roaming customers
- **High Reliability**
  - Service Level agreements offering up to 99.999% uptime
  - 100% uptime operational service record
  - 24x7 call center support
- **Advantage of GL’s WWRN**
  - Every satellite tracked by 2-3 reference stations
  - No missing satellites
  - Assistance data can include information on rising satellites resulting in fewer assistance data transactions
  - Opportunity for custom orbit modeling, key to 4 day ephemeris

GL Multi-Mode Operation

Supports three standard modes and one proprietary mode

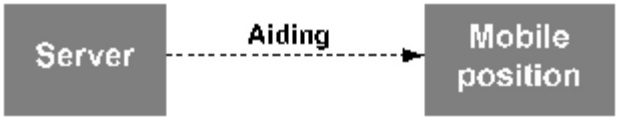


MS-Based **(aiding info is good for hours)**
Computes fix in MS device
Fastest update-time fix mode



MS-Assist **(aiding required for each fix)**
Acquisition-assistance from network
Network time impacts compute time

Autonomous **(aiding directly from satellite, thus not for high-performance TTFF)**
Ephemeris data from satellite
Off-network, slowest time-to-fix

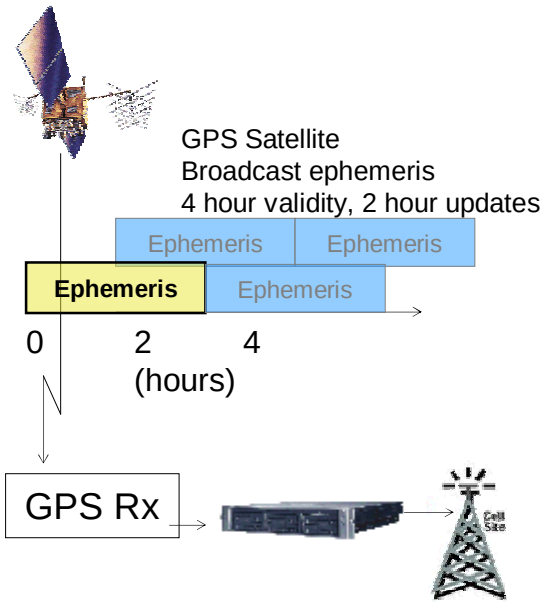


Enhanced Autonomous Mode **(LTO good for days)**
With LTO (long-term orbits)
Autonomous mode

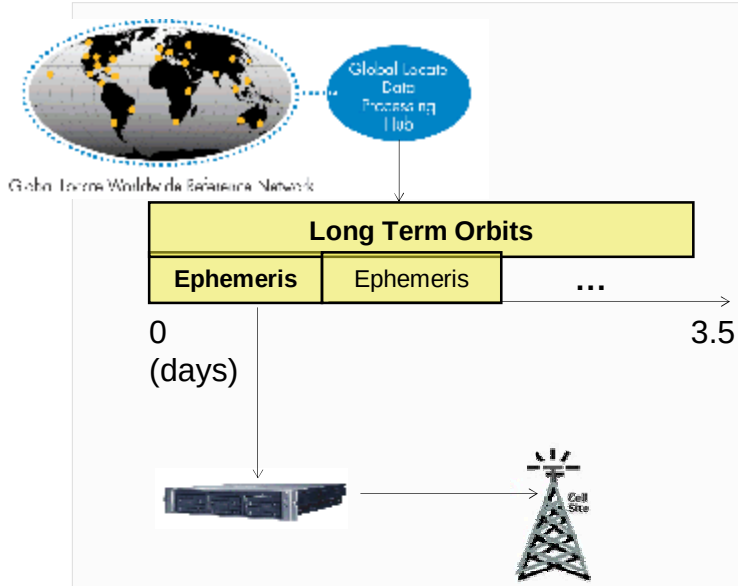
Obtaining GPS Ephemeris with Global Locate Solutions

	Ephemeris location	Ephemeris validity time	Ephemeris transportation	Cellular Operator Support	
MS-Assist	A-GPS Server	3 minutes	Over cellular network	Yes (A-GPS Server)	
MS-Base	A-GPS Server	2 to 4 hours	Over cellular network	Yes (A-GPS Server)	
Autonomous	GPS Satellites	2 to 4 hours	Directly from Satellites	No	
Enhanced Autonomous	Global Locate FTP server	2-4 days	Any internet connection (LAN, WiFi, Bluetooth, GPRS)	No	

Multi-Day Ephemeris LTO Technology



Ephemeris good for maximum of 4 hours



Ephemeris good for 2-4 days

Benefits of AGPS without access to assistance data server

Secure User Plane Location-SUPL

- **SUPL is a standards-based protocol that allows a mobile handset client to access a network-based location server**
  - Allows for secure control and access of location information by carriers = Revenue from LBS
- **Specification being finalized in Open Mobile Alliance (OMA)**
- **SUPL allows for both types of location requests:**
  - mobile initiated (home and roaming)
  - network initiated (home and roaming)
- **SUPL is seen as quick time to market, lower cost solution vs. current control plane implementations**
  - Many operators worldwide showing interest in SUPL terminals and server solutions
- **GL has developed a SUPL Server (SLP) and client S/W**
  - GL WWRN uniquely suited for roaming aspects of SUPL
  - END to END testing is critical…

U-plane techniques: LTO versus SUPL

- **LTO**
  - Assistance data consists of satellite orbit information
  - HTTP secure file download
  - AGPS operation for 2+ days without loss of accuracy
  - Cell tower position not utilized
  - Old position/real time clock forms estimated position and time (but software must be robust against long distance travel)

Versus

- **SUPL**
  - Industry standard protocol developed by OMA, uses any TCP bearer
  - GL product is a SUPL Location Platform (SLP)
  - Assistance data consists of satellite orbit information + cell tower position + current time
  - Software assumes and relies on accuracy of assistance data

A-GPS Smartphone Powered by Global Locate Technology

Operator Interest in A-GPS (Europe)

- One group that is actively pushing SUPL now:
  - Vodafone (Jasmin Trial April 2005), Orange (SUPL Trial September 2005)
  - Mobilkom (currently testing the hw6500 for navigation purposes)
  - TMN (AGPS Trial back in 2004)
  - TIM (SUPL Trial in June 2005)
  - TMobile (AGPS Trial in 2004)
  - Telefonica (currently testing the hw6500 for navigation purposes)
  - BouyguesTel (AGPS Trial in 2004)
  - STC (they plan a commercial deployment late 2005)
- This group totals ~ 400M subscribers.
- A second group that will quickly follow:
  - AMENA
  - SFR
  - Wind
  - TeliaSonera
- They add up another 65M subscribers
- A third group that shows less interest (for now) but will quickly get to speed when the AGPS functionality is present in a wider variety of terminals

Operator Interest in A-GPS (Japan)

- NEC Complete A-GPS Interop Tests

  By Wireless Week Staff
  May 16, 2005

  Qualcomm and NEC Corporation say they have successfully completed assisted-GPS (A-GPS) interoperability testing in Japan on an unnamed commercial 3G W-CDMA network.

- Testing included protocol and network connectivity testing with basic A-GPS operations using a preliminary version of the Secure User Plane for Location (SUPL) interface. SUPL, a standards-based protocol that allows a mobile handset client to communicate with a location server, is a standard in the process of being adopted by the Open Mobile Alliance (OMA) and is expected to be supported by Qualcomm, NEC and others.

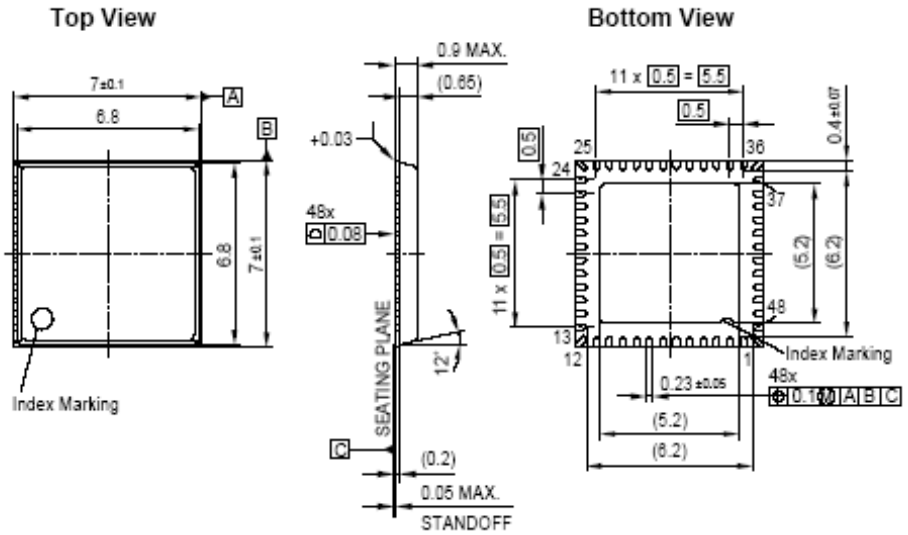
- Interoperability testing was conducted using Qualcomm 's TM6250 test mobile and NEC's location-information system to confirm the accuracy, protocol and end-to-end interoperability of Pre-SUPL. The TM6250 test mobile is powered by Qualcomm's MSM6250 chipset, which contains gpsOne technology. The Pre-SUPL support in the MSM6250 chipset enables operators to begin commercial trials, application testing and network preparation in anticipation of the final-released OMA SUPL specification. To address operator demands, Pre-SUPL support is planned for commercial deployment during 2005, according to Qualcomm.

- The Qualcomm/NEC announcement comes on the heels of the Siemens Communications Group saying it will be one of the first to bring a standardized solution for assisted-GPS (A-GPS) to the market. Siemens is conducting interoperability tests with A-GPS chipset suppliers **Global Locate** and SiRF Technology Holdings and with device makers such as Compal Communication and HP.

A-GPS Semiconductor Products and Solution

Hammerhead Single Chip A-GPS IC

- Highest level of integration
  - Low Cost, Breakthrough solution
  - 0.13µ RFCMOS technology
  - 7 x 7 mm package (single die), 48 pin VQFN
  - Industry smallest A-GPS solution footprint of 75 mm^2
- Partnership with Infineon Technologies
  - Leader in CMOS-RF design and manufacturing
  - One of world's top supplier of semiconductors to cellular industry
- Software compatible with existing Global Locate ICs



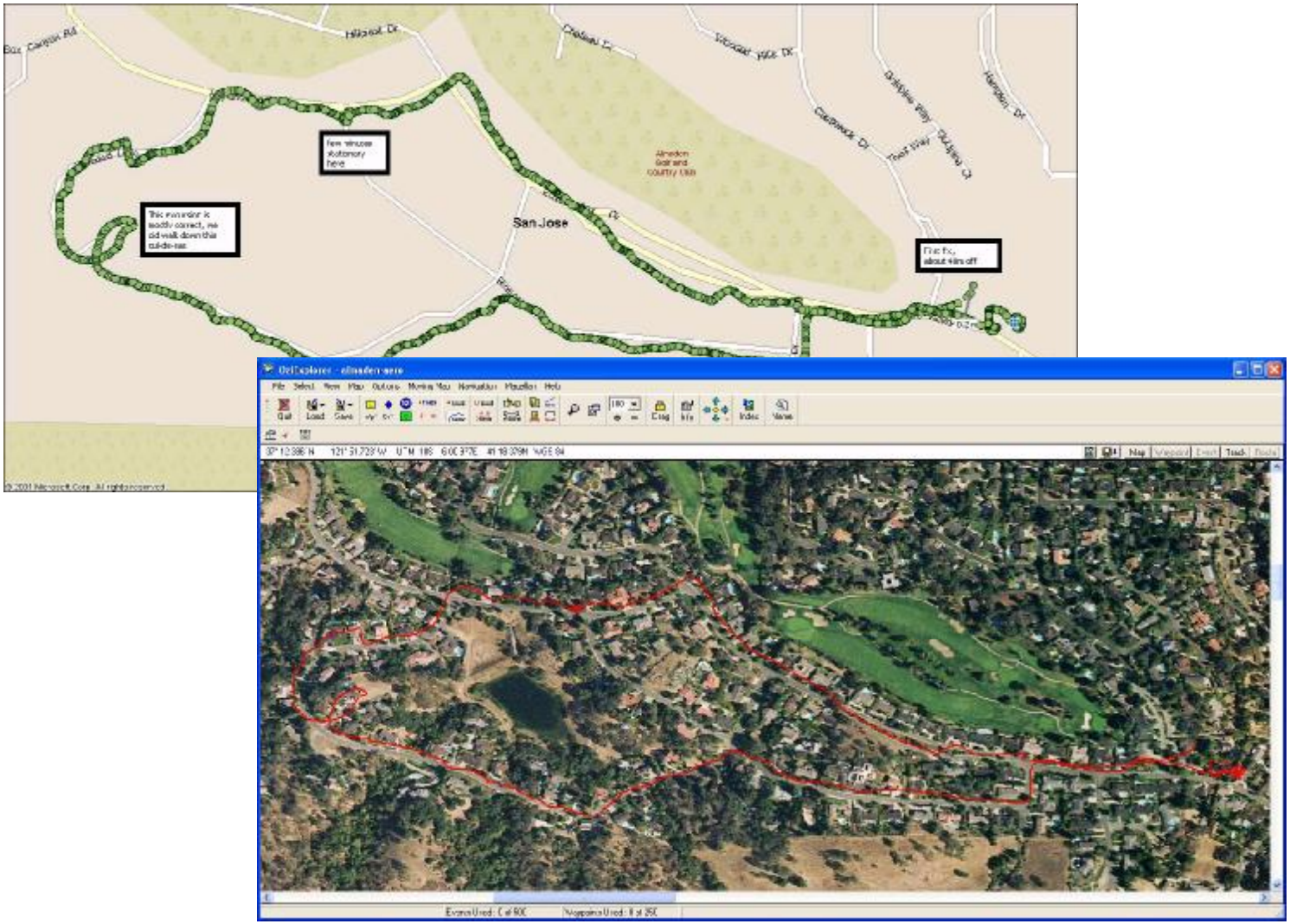
The A-GPS Control Software

- **Assistance data standards support**
  - UMTS/GSM: 3GPP TS 25.331, TS 44.031, and OMA SUPL
  - CDMA: 3GPP2 C.S0022-0-1
- **Multi protocol operations**
  - User Plane: SUPL
  - Control Plane: RRLP, RRC (for 3G)
- **Single library to support all GPS modes**
  - MS-Assist & MS-Based
  - Autonomous & Enhanced Autonomous
- **Low memory resources**
  - < 180K ROM/FLASH
  - < 50K RAM
- **Non-time critical task priority**
  - Enabling tasks to run in parallel
  - Does not disrupt call flow
  - Standard performance benchmarked at 3 MIPS

Performance Examples and Competitive Advantages

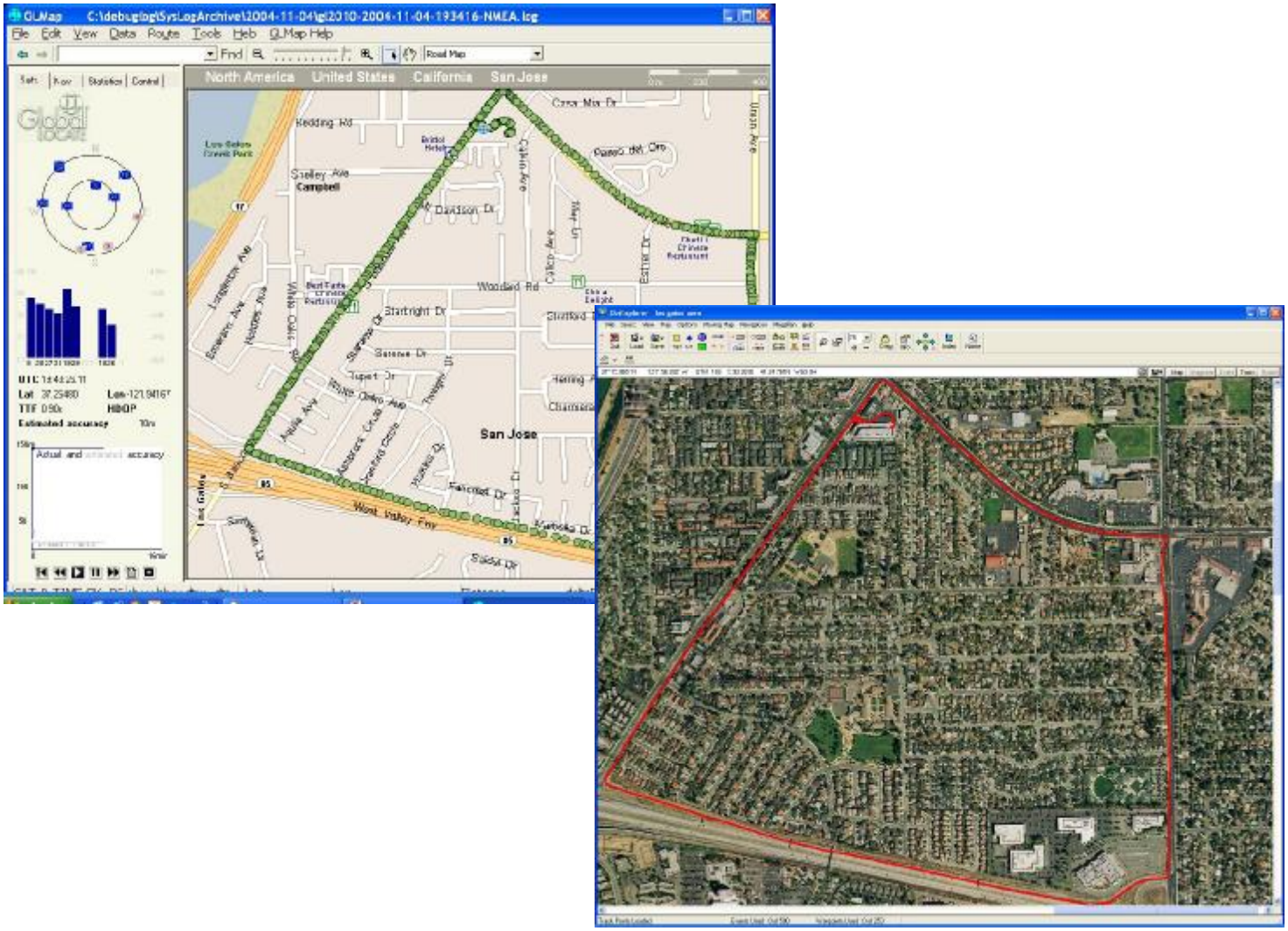
Real World Navigation Performance

GL Location Enabled Wireless device out in the world…. Walking



Real World Navigation Performance

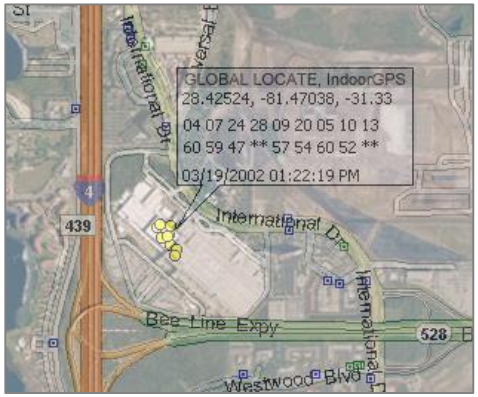
GL Location Enabled Wireless device out in the world…. Driving



Proven Indoor Sensitivity

Indoor Live, at trade shows

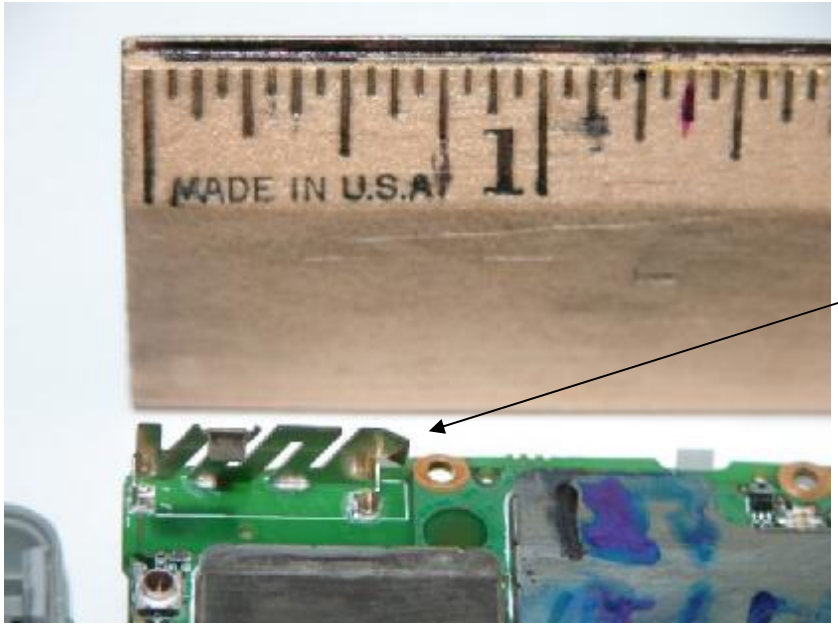
CTIA W2002
Orlando, FL
Inside exhibit hall
–150 to –160 dBm



GPS-Wireless 2004
San Francisco, CA
Inside exhibit hall
–148 to –160 dBm

IEEE PLANS 2002
Palm Springs, CA
Doral Resort Hotel
–140 to –157 dBm

Competitive Advantage



Small, low cost GPS antenna form factor in GL enabled Mobile handset device

- High sensitivity, Fast Fix
- Enables smaller form factor designs, GPS antenna performance tradeoff's and minimizes board space
- Mature, A-GPS standards compliant software,
- *New* SUPL client

Enabling the Business of Location